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"Omnes res creatæ sunt divinæ sapientiæ et potentiæ testes, divitiæ felicitatis humanæ:—ex harum usu *bonitas* Creatoris; ex pulchritudine *sapientia* Domini; ex œconomiâ in conservatione, proportione, renovatione, *potentia* majestatis elucet. Earum itaque indagatio ab hominibus sibi relictis semper æstimata; à verè eruditis et sapientibus semper exculta; malè doctis et barbaris semper inimica fuit."—LINNÆUS.

"Quel que soit le principe de la vie animale, il ne faut qu'ouvrir les yeux pour voir qu'elle est le chef-d'œuvre de la Toute-puissance, et le but auquel se rapportent toutes ses opérations."—BRUCKNER, *Théorie du Système Animal*, Leyden, 1767.

. . . . The sylvan powers
Obey our summons; from their deepest dells
The Dryads come, and throw their garlands
And odorous branches at our feet; the Nymphs
That press with nimble step the mountain-thyme
And purple heath-flower come not empty-handed,
But scatter round ten thousand forms minute
Of velvet moss or lichen, torn from rock
Or rifted oak or cavern deep: the Naiads too
Quit their loved native stream, from whose smooth face
They crop the lily, and each sedge and rush
That drinks the rippling tide: the frozen poles,
Where peril waits the bold adventurer's tread,
The burning sands of Borneo and Cayenne,
All, all to us unlock their secret stores
And pay their cheerful tribute.

J. TAYLOR, *Norwich*, 1818.

ALERE FLAMMAM.

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THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[TENTH SERIES.]

> '.................. per litora spargite muscum,
> Naiades, et circùm vitreos considite fontes:
> Pollice virgineo teneros hic carpite flores:
> Floribus et pictum, divæ, replete canistrum.
> At vos, o Nymphæ Craterides, ite sub undas
> Ite, recurvato variata corallia trunco
> Vellite muscosis e rupibus, et mihi conchas
> Ferte, Deæ pelagi, et pingui conchylia succo."
>
> *N. Parthenii Giannettasi*, Ecl. 1.

No. 19. JULY 1929.

I.—*New African Diptera.*

By E. Brunetti[*].

Leptidæ.

Atrichops nigromaculata, sp. n.

♂.—*Head.* Ocellar tubercle barely elevated, occupying practically whole vertical space, blackish, whitish on hind margin; ocelli whitish grey, hinder pair smaller and flatter; interocular space very narrow, black; the large triangular frons flush with eyes, bluish-grey dusted, as is also whole head below antennæ except proboscis and palpi, which, with the antennæ, are all bright orange. Occiput very concave, bluish-grey dusted, lower part shimmering in certain lights with some rather long pale pubescence.

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[*] The descriptions printed in the following pages are based on material supplied by the Imperial Bureau of Entomology, and were found among the manuscript papers of the late Mr. Brunetti. The types have been presented to the British Museum.

Any alterations or additions made by myself have been placed in square brackets.—D. Aubertin.

Thorax. Dorsum black; humeri, side-margins, hind corners, scutellum and narrowly around bases of wings brownish yellow. Pleuræ bluish-grey dusted, nearly bare.

Abdomen yellow; first two obvious basal segments with a median moderately broad black stripe; second segment has in addition a moderately rounded black spot towards each side; third segment with a median large rounded black spot. Rest of abdomen more orange-yellow, genitalia concolorous. Venter yellow. Pubescence of abdomen short, inconspicuous, yellowish.

Legs yellow; tibiæ and metatarsi obscurely ochraceous, tarsi more blackish. A little short, very fine pubescence on coxæ, front and middle femora; rest of legs with minute inconspicuous black pubescence.

Wings pale yellowish grey, stigma yellow.

Halteres orange.

Length 7 mm.

Described from one ♂, Southern Rhodesia, Saw Mills, 26. xii. 1919 (from the Rhodesian Museum).

Atrichops varicolor, sp. n.

♀.—*Head* bluish grey. Frons flush with eyes, with parallel sides, about one-fifth width of head, with a little fine brown, moderately long pubescence; middle third or more occupied by a large velvet-black spot, its upper edge just embracing the ocelli. Antennal first and second joints blackish with a little grey dust, third bright orange, arista black. Proboscis and palpi blackish, with brown pubescence. Occiput bluish grey, slightly projecting behind eyes, with dense fine long white pubescence and a very large velvet-black spot on upper part on each side of median line.

Thorax shining black with short fine black hairs; in certain lights two median, well-separated bluish-grey dust-stripes can be seen; the same coloured dust appears over humeri and broadly at ends of suture. Anterior corners of humeri brownish. Pleuræ bluish grey, with short white pubescence. Scutellum concolorous with dorsum, similarly clothed.

Abdomen. First segment black, second mainly yellowish, with a narrow median stripe which widens hindwards, and a narrow black hind margin; third and fourth segments dark chestnut-brown, hind margins more or less blackish, fifth orange-red, with hind corners narrowly black, sixth and seventh mainly orange-red, sides more broadly black. Pubescence of abdomen inconspicuous pale, but black on black parts of last segments. Venter on basal half whitish yellow, with a broad black median stripe on third and fourth sternites, remainder orange-red with black sides; tip of venter black.

Legs shining blackish brown; about apical two-thirds of fore femora, apical third of middle pair and base and tip broadly of hind pair, yellowish. Middle tibiæ and metatarsi yellowish.

Wings from base to level of cross-veins pale grey, beyond that point distinctly brownish; costal cell yellowish; stigma dark brown, the colour carried hindwards in diminishing intensity.

Halteres blackish.

Length 11 mm.

Described from one ♀; Uganda: Kampala, 13. vii. 1911. The striking differences of colour should make the species easily identifiable.

Atrichops dimidiatipennis, sp. n.

♀.—*Head.* Vertex and frons flush with eyes; frons with very slightly diverging sides, forming at middle of head one-fifth of that width; upper and lower parts ash-grey with fine sparse black bristly hairs; about the middle third dull black with long dense black-brown hair. Epistome ash-grey dusted, only slightly prominent. Antennæ orange, upper side of first joint blackish. Proboscis and palpi all orange. Occiput ash-grey in ground-colour, with fine white pubescence, but quite black towards each side of upper part, with black pubescence, the colour extending thence towards the centre.

Thorax moderately shining blackish with greyish reflections seen at certain angles, and an obvious though not conspicuous broad median grey dust-stripe with linear sides from anterior margin to scutellum. Pleuræ and scutellum blackish, with greyish reflections; humeri brownish, entire scutellar margin broadly brownish yellow. Pubescence of thorax short, fine, black, except on pleuræ, where it is whitish.

Abdomen all brownish yellow, slightly deeper towards tip; second and third segments considerably blackish in middle of discs; side-margins of [second and] fifth narrowly blackish brown. The sixth segment with a peculiar yellowish-grey stripe towards each side, parallel with it, but set upon a restricted blackish background. Venter brownish yellow; discs of segments more or less infuscated.

Legs. Fore coxæ and femora, middle femora, basal third, and nearly apical third of hind femora brownish yellow. Middle tibiæ and tarsi obscurely yellowish. Front tarsi much longer than the front tibiæ; middle third of hind femora, tibiæ and tarsi black. Middle and hind tarsi much shorter than those of front legs. Pubescence of legs short, uniform, black; coxæ with blackish-brown pubescence apically on posterior pairs, but to a much less extent on fore pair. A little fine whitish pubescence on front side of fore coxæ and on apical third of under side of fore femora; some fine pale pubescence on lower side of middle femora.

Wings grey on basal half, smoke-grey on remainder, the dividing-line passing just before costal cell, just after base of first submarginal cell, and touching tip of second basal cell. Rather brownish from middle of costa hindwards, the colour dying away behind middle of wing.

Length 10 mm.

Described from two ♀♀, Nigeria: Ibadan, type, 27. iii. 1923; co-type, 10. viii. 1920.

In the co-type there is more black on the abdomen, and the scutellum is almost wholly pale. A ♂ from Uganda might possibly belong here. The essential characters are mainly identical, but the thorax is yellowish brown, the legs mainly yellowish, and the hind legs very much more pubescent. Uganda: Kampala, 17. xi. 1915 (*C. C. Gowdey*).

Nemestrinidæ.

Prosœca olivacea, sp. n.

♀.—*Head.* Vertical triangle very large, well raised, with dense, long, brown and yellowish bristly hairs; ocelli small, brownish. Frons less than one-third width of head, rather rapidly widening from above downwards, pale grey, covered with long whitish pubescence, as is also under side of head. First antennal joint grey-dusted, second orange-yellowish, with some long pale hairs above and below; third joint black, elongate, conical, with very long thin style. Proboscis black, about 13 mm. long. Occiput slightly concave, ash-grey, with whitish pubescence.

Thorax. Dorsum, pleuræ and scutellum dull olive-grey with long dense brownish-yellow pubescence.

Abdomen. Darker brownish grey; second segment with long yellowish pubescence; rest of abdomen with shorter pubescence, but fourth and fifth segments with some long fine hairs intermixed. Venter with similar long yellowish pubescence.

Legs all orange, except coxæ and base of femora more or less olive-grey. Pubescence whitish, long on inner, outer, and under sides of fore femora, front, hind and under sides of middle pair and inner, outer, and under sides of hind pair.

Wings pale grey, venation normal.

Halteres yellowish, with blackish clubs.

Length 9 mm.

Two ♀ ♀, Natal: Willow Grange, 25. iii. 1914 (*R. C. Wroughton*).

The species runs down to *P. accinota*, Wd., in Prof. Bezzi's table of African species (Ann. S. Afr. Mus. xix. p. 175), *P. olivacea* differing from it by the absence of the fuscous spots on the wings.

Atriadops cinnamonea, sp. n.

♀.—*Head.* Frons with dense, depressed, mouse-brown pubescence. Antennæ a little yellowish; apical half of third joint and the long arista blackish. Face brownish grey, with long, dirty whitish-grey pubescence; lower part of head similarly clothed; occiput flush with eyes, grey-dusted.

Thorax. Ground-colour mouse-brown; dorsum with long dense pubescence which is mouse-brown on the disc, rather paler towards sides and on pleuræ and nearly whitish on hind corners of dorsum.

Scutellum with pale mouse-brown pubescence.

Abdomen blackish brown, with sparse, very short, yellowish pubescence; venter similar. Ovipositor ending in two very long, slender, cylindrical styles.

Legs yellowish; fore coxæ with long, dense whitish pubescence; femora a little more brownish. Pubescence of legs yellowish, rather sparse, that of femora black; a distinct fringe of such pubescence on under side of all three pairs, and also on front side of middle pair.

Wings dark cinnamon-brown; central part of first and second basal cells, also hind margin of wing basally a little paler; a small elongate yellowish-white spot placed transversely at about two-thirds the length of the wing lying between first and third veins; tip of fourth vein broadly black infuscated, also subapical section of fifth and tip of sixth.

Halteres brownish yellow.

Length about 9 mm.

Two ♀♀, Nyasaland, Mt. Mlanje, 29. xii. 1913, type; British East Africa, near Kisii, South Kavironda, 12. v. 1911, co-type.

In the second specimen the pubescence on the face and sides of the thorax is a little whiter, and the wings are rather less dark.

Mydaidæ.

Rhopalia tutankhameni, sp. n.

Head about three times as wide as long. Frons and face with uniformly curved sides (concave); at level of antennæ distinctly more than half width of head, black, covered, though not densely, with long bright yellow rather shaggy hair; a margin of yellow dust along sides of face. Oral region bright orange; mouth-opening large, oval, interior edge black-bordered; proboscis elongate, subcylindrical, moderately slender, about half as long as antennæ, horizontal; labella rather large. Antennæ bright orange, except first joint a little black at base above; quite bare except for a short yellow hair on upper side of first and second joints; first joint short; second very short, practically annular, third with stem more than three times as long as first and second joints together, the elongate club nearly as long as the stem. Occiput considerably concave, black, with yellow dust and a little short pubescence.

Thorax bright orange-brown with a somewhat reddish tint in centre of dorsum; a median moderately wide black stripe from anterior margin nearly to middle; pleuræ mainly black, bare, but humeral region and immediately around base of wings yellowish orange. Scutellum very small, reddish orange, base and centre blackish; metanotum shining black, but orange on basal corners. Pubescence or thorax confined to a little short bright yellow hair on dorsum, rather longer in front of wing-base.

Abdomen orange-yellow; second segment with a short, deep black, narrow elongate mark toward the sides on hind margin; extreme base of most of remaining segments a little brown. Genitalia shining reddish orange, with a number of shining more or less carmine spines. Pubescence of abdomen limited to a little, short, bright yellow hair on anterior margin of first segment. Venter black, segmentations a little yellowish.

Legs bright orange to tarsi-tips, but the coxæ mainly blackish; hind femora below with two rows of about seven rather long yellow spines; a little inconspicuous yellow pubescence on hind legs, the pubescence still less noticeable on anterior pairs except for a few isolated long stiff yellow hairs on outer side of middle tibiæ; claws black.

Wings rather dark blackish brown, but nearly basal third and all costal and subcostal cells yellowish.

Halteres orange-yellow.

Described from a perfect ♀. Anglo-Egyptian Sudan, Erkowit, 17. v. 1917 (*H. H. King*).

The species is named after the Egyptian Pharoah, whose tomb was opened on the day of its description.

Rhopalia flavomarginata, sp. n.

♀.—*Head.* Frons and face taken together distinctly broader above than below, at middle line of head occupying about half width of head. Middle part of frons shining black, uneven; sides broadly yellowish grey, with moderately long greyish pubescence. Sides of face similarly coloured, with concolorous pubescence; mouth-region orange-brown, slightly prominent in profile, with long greyish pubescence. Antennæ orange-brown, first and second joints cylindrical, second half as long as first, third black, narrower on basal half than second, and as long as first and second together; club large, oval, as long as rest of third joint, black, wholly orange on inner side. Proboscis extremely short, black, barely projecting from mouth-opening; lower part of head hardly projecting below eyes in profile, occiput only slightly projecting, grey-dusted, with some long pale hair on lower part; centre blackish.

Thorax yellowish-grey dusted, with short yellow hairs. Three black stripes of usual pattern, subequal in width, median one reaching anterior but not posterior margin, outer ones shortened in front but attaining hind margin. Humeri conspicuously orange, shining, bare. Pleuræ black, nearly bare, orange about base of wing; an oval, yellowish-grey dust-spot below humeri and a triangularly shaped one on hypopleura.

Abdomen shining black; hind margins of all segments with clear-cut orange-yellow bands of about one-fourth to one-third length of each segment. A large whitish-yellow spot on anterior corners of first segment. Whole dorsum with sparse, very fine, short yellow hairs. Venter practically a replica of dorsum. Genitalia reddish orange, with a row of fine similarly coloured blunt spines on each side and short yellow pubescence.

Legs orange-yellow; anterior coxæ and a spot on outer side of hind pair black. Hind femora considerably and uniformly incrassate, with four rows of spines on apical half of under side, the two inner rows of about seven or eight spines each, the two outer rows of four to five spines each. Under side of hind femora blackish. Pubescence of legs hardly noticeable, pale.

Wings pale grey, a barely preceptible brownish infuscation along veins in anterior and middle parts of wing.

Halteres yellow.

Length 12 mm.

One ♀, South Rhodesia, Matopos, 2. v. 1920 (sent by Rhodesia Museum).

Mydas ignicornis, sp. n.

? ♂—*Head.* Eyes with inner margins decidedly concave, equally widely separated at upper and lower levels; in middle line, frons half width of head. Frons and face black, with long rather shaggy yellow hair; vertex considerably sunk; ocellar triangle placed at upper end of median ridge. Face immediately below antennæ brownish orange, with a median blackish line; mouth-border also brownish orange; sides of face yellowish-grey dusted. Antennæ wholly fiery-red, quite bare; first and second joints rather more brown, second barely half as long as first; third more slender than first or second, cylindrical, about three times as long as first and second together; club obtusely ovate, widest at tip, three-fourths as long as third joint and two or three times as wide, with a very short obtusely pointed apical joint. Proboscis brown, black above, barely extending as far as third antennal joint. Occiput black, margin broadly yellowish-grey dusted, a little inconspicuous yellowish pubescence on its lower part.

Thorax orange-brown, centre of dorsum blackish (? discoloured); pleuræ and scutellum concolorous; stenopleura, lower parts of mesopleura, and hypopleura black; metanotum black behind. Whole thorax nearly bare, dorsum microscopically punctate.

Abdomen more than twice as long as thorax, microscopically punctate, mainly orange-brown, subcylindrical, very slightly narrower in middle. First segment black, with band of yellowish pubescence on hinder half, and a transverse patch of greyish pubescence on anterior corners; a narrow, irregularly outlined, transverse black band over junctions of second and third segments and again over those of third and fourth; second and third segments narrowly livid yellow on hind margins. Bases of fifth, sixth, and seventh segments broadly but irregularly blackish. Abdominal pubescence very sparse. Venter orange-brown; hind borders of first to fourth segments narrowly livid yellowish. Genitalia orange-brown, mainly concealed.

Legs orange-brown. Hind femora gradually enlarged apically, with two parallel rows of five or six short blunt spines on distal half. Pubescence of legs quite inconspicuous, yellowish.

Wings yellowish brown on anterior half, darker brown in first basal cell (except at base) and from its tip to tip of wing, also along outer side of discal cell. Discal cell itself and anal cell nearly clear; rest of wing pale yellowish grey.

Halteres dark brown.

Length 20 mm.

One specimen, apparently a ♂, Rhodesia, Bulawayo, Hillside, xi. 1916 (sent by Rhodesia Museum).

Leptomydas suffusipennis, sp. n.

♂ ♀.—*Head.* Frons and face with sides gently curved outwards, broadest at level of antennæ, where they occupy more than half width of head; both wholly covered, as are also vertex and lower part of head; with long, rather shaggy, greyish-white hair, through which the shining black ground-colour is visible. Antennæ cylindrical, first joint twice as long as wide, shining black, with a few fine pale hairs; second joint extremely short, black, with some soft pubescence; third long, about three times as long as first and second together, slender, the club half as long as the joint but broader; broadest at a little beyond centre, bare, a yellowish irregular band across the middle; a small but obvious obtuse conical apical joint, bare. Proboscis black, shorter than antennæ; occiput barely projecting behind eyes in profile, yellowish grey, with a little short concolorous pubescence, head barely projecting below eyes.

Thorax. Dorsum brownish grey; humeri and side-margins more or less dull orange-brown; four dorsal black stripes, of which the median ones are closely approximated, reaching front margin, the outer ones beginning just behind humeri; all four stripes barely attaining hind margin. Pleuræ brownish or greyish, varying in parts. Scutellum blackish, metanotum rather prominent, grey-dusted, with long erect whitish hairs. Whole thorax with short yellowish or greyish pubescence.

Abdomen elongate cylindrical, gradually tapering a little to tip, about three times as long as thorax (and scutellum). Ground-colour black, moderately shining; first segment shining dark blackish brown, hind margin broadly brownish yellow, the colour with well-defined outlines; second segment brownish yellow, with an impressed transverse line just beyond base; a moderately large blackish spot on anterior corners and a small oval black spot on each side nearly contiguous to hind margin. Third, fourth, and fifth segments with dorsum and sides brownish yellow, with a similar, moderately large, black triangular spot on each anterior corner; sixth segment with hind margin moderately widely brownish yellow. Pubescence of abdomen sparse and greyish, except on first segment, which is nearly covered with it, and on anterior corners of second segment, where it is much longer and denser. Venter yellowish brown, more or less blackish in centres of segments. Genitalia in ♂ exposed in type; a broadly bifid dorsal plate, with an elongate well-curved sheath protecting the penis, projecting upwards between the lobes of the plate; a large more or less globular piece bearing on upper side a pair of moderate-sized claspers, and a short, somewhat keel-like, ventral plate; all the organs rather dark brown, with lighter parts; all covered with moderately dense, fairly long, yellowish soft hairs. Genitalia in ♀ small, protected by a row of seven (type ♀) or eight (co-type ♀) moderately long and thick blunt spines towards one side.

Legs brownish orange, coxæ brownish-grey dusted, upper sides of femora more or less blackish; pulvilli pale yellowish, claws black. Pubescence of legs pale yellowish, sparse, a little longer on tibiæ, longest on inner side of hind pair. Hind femora with two short parallel rows of short spines below on apical half.

Wings pale grey, all veins rather broadly but only just obviously suffused with pale brown; venation normal.

Halteres yellowish, with brownish knobs.

Length 16–18 mm.

Bulawayo, 28. ix. 1923, type ♂; 9. ix. 1917, type ♀; 30. ix. 1923 and 24. ix. 1913, co-type ♀ ♀, all sent by the Rhodesia Museum.

Therevidæ.

Phycus breviscapus, sp. n.

♂.—*Head.* Eyes most nearly touching at level of ocellar tubercle; frons widening thence to double its width at a little above antennæ, at which point it is rather wider than a quarter of the head ; shining black, smooth, bare. Ocellar tubercle moderately raised, filling space between eyes ; ocelli brown. Lower part of frons with whitish-grey reflections. First antennal joint relatively shorter than in *P. brunnipes*, Wd. (an Oriental species), second joint one-third length of first, third nearly double as long as first ; first and second black, with usual bristles, third grey-black, bare, with minute apical cylindrical style. Face with whitish-grey reflections viewed from above, blackish viewed frem below, bare. Proboscis brownish yellow. Occiput mainly blackish with black bristly hairs, but ash-grey on lower part, where it projects a little in profile, bearing a distinct yellowish-grey fringe.

Thorax shining black, dorsum with yellowish-grey pubescence ; pleuræ shining black, nearly bare, with greyish reflections ; sternopleuræ microscopically grey-dusted ; scutellum black with grey reflections. One dorsocentral (scutellar) bristle, one supra-alar, one postalar, two notopleural, one apical scutellar, all strong and subequal.

Abdomen shining black ; hind margins of second and third segments narrowly but distinctly cream-yellow, with a fringe of white hairs ; first, second, and third segments towards sides clothed with whitish hairs. Pubescence of rest of abdomen blackish brown. Genitalia blackish brown, black pubescence, a nearly oblong dorsal plate prominent, also a pair of claspers which are obtuse and reddish at tips. Venter approximately as dorsum.

Legs. Fore coxæ, fore femora, middle femora, and middle tibiæ brownish yellow, posterior tarsi obscurely so ; rest of legs shining black. A few long bristly black hairs at tips of coxæ ; pubescence of legs otherwise negligible.

Wings nearly clear, but costal cell and wing tip as far inwards as outer side of discal cell distinctly brownish infuscated, the submarginal cell having a small nearly hyaline spot near tip ; fourth posterior cell considerably narrowed at tip.

Halteres brownish, clubs black.

Length 7½ mm.

One ♂, Uganda, 20. iii. 1925 (*H. Hargreaves*). The relatively short first antennal joint is the principal character of this species ; in the Indian species it is as long as the third joint.

Phycus sobrinus, sp. n.

♀. Very near *P. fuscipennis*, A. Costa, of S. Europe, but differing in several points. First antennal joint a little longer than second and third together, second joint about one-seventh the length of the first, dark brown, covered only with uniformly very short bristly black hairs. Frons and face with gently and uniformly curved sides, at level of antennæ a little over one-third width of head; a broad transverse white space below antennæ from eye to eye. Frons with a narrow bordering of white dust each side on lower half.

Thorax with very short yellowish-grey pubescence; pleuræ grey-dusted, but nearly bare of pubescence.

Legs blackish brown; about middle half of fore femora brownish yellow below; all knees very narrowly brownish yellow.

Wings quite clear grey, with hardly a suspicion of brown, anterior margin not darker; fourth posterior cell closed distinctly before border.

In all else closely as in description of *P. fuscipennis* by Röder of a ♂ received by him from Loew as *Phycus tristis*, Loew [Berl. ent. Zeitschr. xxix. p. 140, 1885].

Length 6 mm.

Described from one ♀ from Khartoum, 31. xii. 1917 (*R. Cottam*).

Platypezidæ.

Platypeza thomasseti, sp. n.

♂ ♀.—*Head* in ♂ with upper facets of eyes bright brown, closely contiguous for fully half their length, very clearly demarcated in size and colour from the small black lower ones. Vertical triangle filled by the black ocellar tubercle with shining brownish-red ocelli. Face and antennæ moderately dark ash-grey. Occiput black, bare except for a little short black pubescence on under side. In ♀ frons moderately shining black, widening gradually to vertex, at a little above level of antennæ less than one-third width of head. Ocelli conspicuous, set in a vertical depression; antennæ blackish; face ash-grey, the colour extending a little over lower part of frons; mouth-opening more or less blackish.

Thorax in ♂ dull black, hinder half of dorsum glistening bluish grey, not extending to scutellum. Only the hindmost pair of dorsocentral bristles present (apparently), well separated. In ♀ thorax blackish grey with two narrow median brownish stripes sufficiently obvious, the grey shimmer less conspicuous but covering dorsum of scutellum also.

Abdomen dull velvet-black with a few sparse fine black hairs; venter black, yellowish basally.

Legs brownish yellow, darker in parts; femora on apical half more or less black. Tarsi in ♂ normal; first joint yellowish with black tip (type ♂), remaining joints black; seen in profile, first three joints with upper and under sides subequal in length, fourth a little shorter but only half as wide, fifth similar to fourth, but a little smaller. Hind tarsi in ♀ with first joint as in ♂, second much longer on upper than on under side, third much longer than in ♂, fourth much larger than in ♂, upper side much longer than under, fifth as in ♂ but very much smaller than fourth. Colouring of legs evidently variable, judging from the 2 ♂ ♂ and 1 ♀ before me.

Wings clear, distinctly brownish at tips from just before tip of first vein down to bend in fourth vein, where the colour dies away proximally.

Halteres very large, black.

Length about 3 mm.

Natal, Weenen, iii. 1925, type ♂ ♀, iii.–iv. 1925, co-type ♂ (*H. P. Thomasset*).

The conspicuous brownish wing-tip easily characterizes this species.

Platypeza natalensis, sp. n.

♂.—*Head.* Eyes quite contiguous for a considerable distance, large and small facets well delimited; vertex filled by well-raised blackish ocellar tubercle, ocelli brownish, inconspicuous. Frons and face ash-grey, practically bare. Antennæ brownish; mouth-opening and proboscis yellowish brown, palpi bright ferruginous, occiput black.

Thorax blackish, dull, scutellum similar, with one pair of rather weak apical bristles; pleuræ obscurely brownish yellow.

Abdomen dull velvet-black, bases of segments from second onwards extremely narrowly ash-grey, also tip of ultimate segment; whole dorsum with fine pale sparse hairs. Venter whitish grey.

Legs obscurely brownish yellow; femora, especially hind pair, decidedly blackish except at base and tips; hind tibiæ dull black; first three tarsal joints dilated. Legs practically bare.

Wings absolutely hyaline.

Halteres blackish.

Length about 2¼ mm.

One ♂, Natal, Weenen, x. 1924 (*H. P. Thomasset*).

Syrphidæ.

Baccha sinuata, sp. n.

♂ ♀.—*Head*, ♂. Vertical triangle rather elongate, nearly flush with eyes, with a little blackish-brown hair; ocelli small, distinct, shining brown, the anterior ocellus at extreme tip of vertical tubercle. Frontal triangle large, prominent, shining dark brown with bronze and purple reflections, changing gradually to brownish yellow on anterior margin. Frons with dark brown pubescence. Antennæ brownish yellow, first and second joints with usual bristly pubescence, third joint a little darker above, arista concolorous. Face prominent, brownish yellow, as are also proboscis and palpi; mouth-border darker. Some very short, sparse, pale yellow pubescence on face. Occiput and lower part of head æneous, former with whitish dust.

Thorax including pleuræ and scutellum all bright orange-yellow; four not very definite narrow longitudinal black stripes running nearly from front to hind margin; centre of dorsum in addition indefinitely blackish.

Abdomen brownish ochraceous; tip of second segment with shining black band, subsequent segments more or less blackish towards sides on apical half. Pubescence of abdomen yellow and conspicuous at sides for some distance from base, that of dorsum very short and inconspicuous.

Legs yellowish, practically bare; hind coxæ, femora except narrowly at tips, and apical half of hind tibiæ black.

Wings very broad, pale yellowish grey, nearly clear; first vein much blacker and more conspicuous than usual; costal cell smoky grey, stigma large, distinct, yellowish grey; third vein very sinuous, bending suddenly upwards at about middle of first posterior cell. Anal cell as in normal species of this group.

Halteres obscurely yellowish.

In ♀, frons about one-ninth breadth of head just below vertex, sides parallel for a short distance only, thence rapidly diverging; ocelli placed nearly midway between vertex and antennæ, no obvious tubercle but the frons at that spot slightly swollen. A yellowish dust-band across frons, narrowed in middle just above frontal triangle. Rest as in ♂.

Length 9–10 mm.

Two ♂ ♂, two ♀ ♀. Gold Coast, East Province, Asamankese, 1926 (*G. S. Cotterell*) ("larva predaceous on cocoa Psylla").

The species comes in the group with strongly dilated wings, and is at once separated from all of them except *B. extranea*, Bezzi, by the wings being absolutely unmarked except for the smoke-grey costa and yellowish stigma. From *B. extranea*, Bezzi, it differs by the greater width of wing and brown coloration on the body.

Cerioides dilatipes, sp. n.

♂.—*Head.* Eyes touching for a short space only; upper facets barely preceptibly larger than the others; vertex and occiput orange-brown, well elevated above level of eyes, distinctly and broadly black behind upper part, but disappearing in profile well before middle of eyes; the brown shining ocelli set direct on upper part of frons. Occiput black, entire margin broadly orange-brown. Antennæ orange-brown, third joint yellower. The very short lower part of frons below nearest approximation of eyes, and the face, dull yellow; two narrow median brown stripes on latter, and two others towards sides of face, beginning respectively below antennæ and at eye-margins, and all nearly reaching mouth-border. The rather narrow space between the two median stripes orange at its lowest point and distinctly prominent there. Mouth-opening and proboscis black, sides of head descending below eyes in profile to about half the height of an eye; lower part of occiput projecting a little behind eyes in profile.

Thorax. Dorsum black, finely punctuate and with very short yellowish-brown semi-depressed pubescence. Humeri, side-margins of dorsum indefinitely, and posterior corners orange-brown. Pleuræ mainly orange-brown, but indefinitely blackish on mesopleura, pteropleura, and ventral part. Scutellum orange-brown; hinder part of thorax below scutellum blackish brown.

Abdomen with nearly parallel sides, barely narrower apically; black, finely punctuate; first and second segments subequal, indistinctly separated at sides; third a little longer than second, fourth about one and a half times as long as third. First segment largely, and front corners of second narrowly, orange-brown; second and third segments with very clear-cut lemon-yellow, moderately narrow hind margins. Genitalia formed of a large globular basal piece, orange-brown, with apparently small appendages on the under side. Venter black, with a little grey dust. Pubescence of abdomen pale yellow, very short, visible only at a low angle from in front.

Legs orange-brown, fore tarsi slightly but obviously dilated at base. Pubescence confined to a fringe of short pale hairs below middle femora.

Wings yellowish grey; brownish yellow anteriorly, limited posteriorly by the spurious vein and third vein, the apical part a little deeper; hinder half of second basal cell brownish yellow infuscated.

Halteres whitish.

Length 11 mm.

One ♂, South Rhodesia, Saw Mills, 27. xii. 1920. From the Rhodesia Museum.

Cerioides subcastanea, sp. n.

♂.—*Head.* Eyes separated at closest approximation by as much as distance behind the two hinder ocelli; facets practically uniform; occiput and frons a little raised above level of eyes, chrome-yellow; ocelli shining brown, placed direct on frons. Frons and upper part of face barely prominent in front of eyes, chrome-yellow; a semicircular brown spot (convex side upwards), in which are set the antennæ; a small brown stripe on each side from just below this spot running nearly to eye-margins; two narrow brown lines from upper side of mouth-opening, running upwards, diverging broadly, their upper ends turning inward a little (*i.e.*, about halfway between mouth-opening and base of antennæ). Sides of face below eyes and the mouth-opening brown; proboscis black-brown. Occiput black, with margin broadly chrome-yellow, moderately broad behind vertex but very much narrowed behind greater part of eyes, yet a little broadened on lowest part. Antennæ bare, tubercle very low; first and second joints orange-brown, third darker brown, tip of style yellowish.

Thorax pale chestnut-brown, finely punctuate; two narrow, broadly separated stripes behind suture, not reaching hind margin of dorsum, but curved (convex side outwards); the humeri very prominent, a narrow short stripe on hind margin of mesopleura just in front of wing-base, and an adjacent similar stripe on front side of pteropleura, a broad one on upper part of metapleura, all lemon-yellow. Scutellum pale chestnut-brown, with margin lemon-yellow, continued as a ligature-like line thence to the wing-base. Pleuræ finely punctuate, pale chestnut-brown, with greyish-white dust; metanotum similar. Pubescence of dorsum microscopic, bright yellow.

Abdomen pale chestnut-brown, finely punctate; first segment with a narrow, very clear-cut lemon-yellow hind margin; second segment not much longer than first, rather narrower towards tip; third much contracted on basal half, broadening rapidly to double that width on hind margin, which has a yellow band like first segment; fourth and fifth segments subequal, forming a large elliptical mass, fifth with broader orange-yellow clear-cut hind margin. All abdomen pale chestnut-brown except basal half of third segment and the chrome-yellow hind-marginal bands as noted. Genitalia concolorous chestnut-brown, globular. Pubescence of abdomen fine, short, bright yellow, seen best from in front. Venter a little darker chestnut-brown and more shining.

Legs darker chestnut-brown, traces of black on femora; base of tibiæ yellowish, tarsi black except basal joint, pulvilli yellow, claws black. Pubescence of legs inconspicuous, whitish.

Wings nearly clear, yellowish from costa to a little behind second vein; stigma barely obvious; broadly dark yellowish brown over tips of marginal and submarginal cells.

Halteres yellowish.

Length 13 mm.

One ♂, Nyasaland, Ruo, 5. v. 1916, "on wild flowers" (*R. C. Wood*).

Conopidæ.

Conops argentispatium, sp. n.

♂.—*Head.* Frons very dark brown, nearly chocolate; vertex with elongate dull brownish-yellow transverse subvesiculose spot. Antennal prominence and frons just above it orange-brown, as is also first antennal joint, second and third joints black, style two-jointed [style three-jointed], yellowish, with a very sharply pointed black tip. A black spot each side of frons on eye-margin just above level of antennæ. Face orange-brown, if seen from above, with yellowish-grey shimmer; mouth-opening and proboscis orange-brown with blackish parts. Occiput black, margin with grey or whitish shimmer.

Thorax black, with very small black bristles; dorsum yellowish-dusted; humeri dull orange-brown with whitish shimmer; pleuræ black with whitish shimmer; scutellum concolorous with dorsum; metanotum and metapleuræ black, latter with whitish shimmer.

Abdomen yellowish grey, its true colour seen best at a low angle in front, transversely wrinkled, but with blackish reflections seen from behind, with small black bristles. Hind margins of first, second, and third segments narrowly paler yellowish and bare of bristles. Genitalia consisting of a large globose basal piece also studded with black bristles similar to those of abdomen, with bright orange-red appendages.

Legs. Coxæ blackish, posterior pairs reddish apically, all, especially fore pair, with conspicuous silvery-white shimmer. Femora reddish brown, more or less blackish above, fore pair mainly blackish; tibiæ more yellowish brown; apical part of outer sides of fore and hind pairs, also hinder side of middle pair, with brilliant silvery-white shimmer. Pulvilli orange, claws black. Pubescence of legs uniform, black, short bristly.

Wings blackish brown on anterior half; hinder part, *i. e.*, first basal, discal, and outer margin of first posterior cells, with all the wing behind them, yellowish grey.

Halteres reddish orange.

Length 10 mm.

One ♂, Uganda, Entebbe, 29. v. 1912 (*C. C. Gowdey*). The species in section GGG of my table of African species (Ann. & Mag. Nat. Hist. (9) xv. p. 97, 1925).

Stylogaster nitens, sp. n.

♂.—*Head.* Vertex and frons shining dark brownish black; antennæ brownish orange, third joint blackish on apical half, style dull orange. Face shining yellowish white with silvery sheen seen from above, proboscis black, yellowish at base. Occiput almost flat, just appreciably concave, blackish, about lower half yellowish.

Thorax shining blackish, dorsum with a little very short greyish pubescence; humeri and pleuræ yellowish, mesopleura more or less blackish. Scutellum and metanotum shining black, former with pair of long fine well-separated apical bristles.

Abdomen shining blackish, reddish orange on basal half of second, third, and fourth segments; a little greyish pubescence; genitalia moderately large, shining dark brown, with a little black pubescence.

Legs. Anterior pairs uniformly pale yellowish; hind pair brownish.

Wings quite clear; second vein ending well before tip of discal cell; submarginal cell much broader than in *S. leonum*, Westw. First posterior cell rather elongate, apical section of fourth vein forming a gentle curve.

Halteres yellowish; knobs blackish.

Length 4 mm.

Ashanti, Obuasi, 26. viii. 1907 (*Dr. W. M. Graham*), "caught on umbelliferous flower."

Two ♂ ♂ in British Museum. In the co-type the reddish orange in the abdomen is less extensive and practically confined to the third and fourth segments.

Muscidæ Calyptratæ.

Graphomyia leucomelas, Wied.

Wiedemann described his species from the ♀ only, from the Cape, noting it as almost identical with the common *G. maculata*, Scop., of Europe, and mentioning therefore only two or three minor differences.

The present ♂, however, proves that *G. leucomelas* is a very distinct species. The markings are of the same pattern as in *G. maculata*, Scop., female, but differ as described below. The ♂ of *G. maculata*, Scop., is quite different, the two median thoracic black stripes being united, the abdomen brownish yellow with quite different markings, and the wings generally brownish-tinged.

♂.—*Head.* Eyes with dense fine brownish pubescence, separated on vertex by about one-seventh the width of the head; frons with parallel sides for some little distance before the eyes diverge; ocellar tubercle on vertex dark grey with black hairs, ocelli pale brown. Side-margins of frons and face rather broadly shimmering white, quite devoid of bristles or obvious pubescence; middle part of frons blackish, with a row each side of about ten long black converging bristles. Antennal first and second joints black, third dark grey. Face whitish grey; oral bristle strong, a moderately long one immediately above and below it, each followed by a row of smaller ones decreasing gradually in size, extending up the prominent edge of the epistome about halfway to base of antennæ, the lower row extending along lower margin of epistome for about same distance. Mouth-opening, proboscis, and palpi blackish; occiput black, margin rather narrowly ash-grey, with a fringe of strong, moderately long bristles.

Thorax ash-grey. Four rather narrow, equidistant, dorsal black stripes; inner pair reaching from anterior margin to halfway between suture and scutellum; outer pair a little broader than inner pair, interrupted at suture and ending further back than inner pair. An elongate spot in middle of hind margin of dorsum, extending forwards, narrowing in width, between the inner pair of stripes, nearly reaching suture. Scutellum ash-grey; a semicircular black spot at base, an elongate one on each lateral edge at base, the colour continued a little over hind corner of dorsum of thorax; two small black spots on hind edge of scutellum, in which are set the apical pair of bristles. Pleuræ and metanotum ash-grey.

Six dorso-central bristles (2 : 4) *, two humeral, one post-humeral, two notopleural; two supra-alar, three post-alar, and two intra-alar bristles. A row of about ten bristles on front margin of mesopleura and a patch of fine hairs on its upper part, which also spreads more sparsely over rest of mesopleura; two strong propleural bristles, two sternopleural (0 : 2), lower ones much weaker than upper; under side of sternopleura with numerous long strong bristles. All or nearly all the bristles set in small black dots.

Scutellum with two marginal bristles each side (both placed less than halfway between base and tip), one pair apical, and a smaller subapical pair. Both thorax and scutellum on the dorsum with a considerable amount of bristly black hair.

Abdomen ash-grey, a little yellowish tinge towards sides posteriorly; first segment very small, black, negligible; second with a curved black spot from each anterior corner, ending on hind margin a little before median line; third and fourth with a transverse row of fine black spots on each as follows. Middle one elongate, placed perpendicularly on anterior margin and reaching beyond middle of segment. The two intermediate spots the largest, triangular, placed on hind margin and nearly extended to front margin. The two outer spots rounded, on hind margins towards sides. Intermediate spots on fourth segment rather smaller than similar spots on third. Fifth segment with two small elongate spots placed perpendicularly a little before hind margin; also a minute elongate spot a little behind front margin. Venter yellowish grey; a small black dot in middle of side-margins of second, third, and fourth segments, fifth segment more ash-grey; covered with fine black bristly hair.

Legs. Femora blackish brown, posterior pairs obscurely brownish yellow apically; tibiæ obscurely brownish yellow. Front femora with bristly hair on upper and outer side and a complete row from base to tip on under side, of long strong spiny bristles, subequal and equidistant; front side without bristles, middle femora with bristly hair on upper, front, and hinder sides and a row of bristles on under side less strong than those of front femora; hind femora with moderately strong bristles on outer and under side, fewer bristles on upper and hardly any on inner side. Two apical bristles on upper side of posterior femora. Fore tibiæ with two definite rows of very short bristles on front side; hinder half with closer, irregularly set bristles; all bristles stronger on apical part of tibiæ; middle tibiæ with two rows of short bristles on outer and one on hinder side; front and inner sides with irregularly and more densely set bristles, all stronger apically; two spiny bristles on middle third of hinder side, four apical bristles. Hind tibiæ with two rows of bristles on hinder side, rest of surface with bristles irregularly and more closely set; four apical bristles (hind one really subapical); a spiny bristle on middle of hinder side and one at middle of outer side. Tarsi normal.

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* There are 2 : 4 bristles in one row and 2 : 5 in the other, the latter is an individual aberration.

Wings quite clear; venation normal, squamæ whitish grey.

Halteres yellowish.

Length 7 mm.

One ♂, Natal, Weenen, xii. 1923 (*H. P. Thomasset*).

Graphomyia parvinotata, sp. n.

♂ ♀.—*Head.* Eyes in ♂ almost punctiformly contiguous, divided only by the extremely narrow whitish orbits. Pubescence of eyes dense, bright brown. Vertical triangle small, black, with black pubescence and a pair of strong ocellar bristles; ocelli brownish. Frontal triangle blackish brown; about ten fronto-orbital bristles of various sizes with long stiff hairs intermixed. Antennæ blackish, normal; second joint with two distinct bristles. Face blackish; pale bluish-grey dusted; oral vibrissæ strong; bristles of facialia diminishing in size upwards, nearly extending to base of antennæ. Peristome with numerous short black hairs and a row of fine marginal bristles. Proboscis and palpi black, former brownish in parts. Occiput ash-grey, barely projecting behind eyes in profile just below their middle, and with a fringe of black bristles on margin.

Frons in ♀ a little wider below than above, at former point about one-third width of head. An inner vertical bristle divergent, outer one convergent, post-vertical divergent *. Frontal stripe with negligible hairs; orbits outside of fronto-orbital bristles closely beset with short stiff hairs. No external orbital bristles. Anterior part of epistome bare.

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* [The inner vertical bristles appear to be convergent, and the outer ones divergent, but the specimen is somewhat damaged.]

Thorax black; dorsum with three bluish-grey stripes from anterior margin to well behind suture, thence they take the form of two much broader stripes, reaching hind margin of dorsum. Side-margins of dorsum similarly coloured. Scutellum black, with traces of bluish-grey shimmer on margin. Pleuræ mainly bluish-grey dusted. Two humeral, one post-humeral, two notopleural, two presutural, four postsutural outer dorsocentral, two supra-alar, two post-alar, and two intra-alar bristles. Hind pair only of inner dorsocentral (acrostichal) bristles as strong as the uniformly sized outer ones. Scutellum with one apical and three marginal or pre-marginal bristles. A close row of strong bristles on mesopleura; no anterior, two posterior sternopleurals; hypopleural bristles fine.

Abdomen black, with numerous small bluish-grey dust-spots placed as follows: a triangular one in middle of hind margin of first segment, sides of this segment and ventral part largely bluish grey. A triangular spot each side of median line, at base of second, third, and fourth segments; a discal roundish spot towards each side of these segments; a larger irregular one on side-margin extending more or less over venter on second, third, and fourth segments; hind margin of fourth segment also bluish grey. Venter with a whitish spot in the middle of each sternite. Pubescence of abdomen dark brown, dense, uniform.

Legs dark brown; coxæ greyish-white dusted, with long bristly hair; pubescence and bristles of legs black. Fore femora with a distinct row of well-defined, fine, long bristles on upper, outer, and under sides, with fine stiff hairs intermixed on these three surfaces; middle femora with uniformly soft pubescence, very sparse on upper side, especially on apical half; two strong bristles on this side towards tip; hind femora with a row of about ten long fine bristles on under side and a row of less strong ones on outer side; upper and inner sides nearly bare. Fore tibiæ with uniformly short bristly hair, middle pair with five bristles on hinder side; hind pair with a front and hind one on outer side just beyond middle. All tibiæ with apical bristles; pulvilli orange-yellow, claws black.

Wings nearly clear or with just a perceptible brownish tinge. A very conspicuous whitish or yellowish-white dust-spot in front of and contiguous with base of costa. Alar squamæ blackish, with an equally conspicuous whitish spot at base; margin narrowly yellowish, with concolorous fringe. Squamæ a little paler, with narrow, conspicuous, yellowish-white margin and similarly coloured short fringe. Surfaces of both pairs of squamæ with microscopic black hairs.

Halteres rather small, dark brown.

Length 7–8 mm.

Described from 2 ♂ ♂ and 2 ♀ ♀ in excellent condition. Kenya Colony, Masai Reserve, 11. v. 1913, type ♂; 16. v. 1913, co-type ♂; five to seven miles into Kenya Forest, near Luchi River, 9–10. ii. 1911, type ♀; east side of edge of forest of the Aberdare Mts., 7300 ft. 24. ii., 1911, co-type ♀ (*T. J. Anderson*).

A pretty species, which should be easily recognizable.

Trypetidæ.

Adapsilia melancholica, sp. n.

♀.—*Head.* Ground-colour pale yellowish, *i. e.*, occipital margin, vertex rather narrowly, and greater part of face; frons brownish, indistinctly blackish above antennæ. Foveæ shining black, intermediate ridge pale yellow. Antennal first and second joints blackish brown, third dull reddish brown. Proboscis and mouth-opening blackish; a small black stripe from lower corner of each eye on each side of face. Occiput yellowish, centre indistinctly blackish.

Thorax blackish brown; humeri, side-margins broadly as far as suture, also scutellum brownish yellow, latter blackish basally. Pleuræ blackish; brownish yellow below humeri, above front coxæ, on upper and hinder side of mesopleuræ, around wing-bases, and on metapleuræ; metanotum black, a little shining.

Abdomen dark chestnut-brown; first segment blackish, but brownish across the middle, fifth segment rather bright yellow, short but conspicuous. Genitalia blackish brown, obtusely conical; a pair of small, sharp, conical, tooth-like appendages towards the cylindrical tip. Pubescence of abdomen rather uniformly short, black.

Legs. Coxæ, femora, and front tibiæ blackish brown, posterior tibiæ and all tarsi brownish yellow; pulvilli yellowish, claws black.

Wings brownish grey, darker and more yellowish brown on anterior half, down to third vein, latter definitely but narrowly infuscated.

Halteres yellowish.

Length about 12 mm.

One specimen, apparently a ♀, N. Nigeria, around Comu, "near stream, in thick bush," 14. vi. 1912 (*Dr. Scott Macfie*).

Adapsilia sublatipennis, sp. n.

♀.—*Head.* Frons large, quadrate, pale brownish yellow with minute brown punctures, which are continued broadly down sides of face and more narrowly to under side of eyes. Antennæ reddish orange, basal joint more yellowish, third joint (measured in side-view along its middle line) more than double as long as its greatest width. Face yellowish, ridge below foveæ low but distinct; foveæ a little blackish on lower ends, the black colour continued in a fine curved line each side at a short distance above mouth-opening. Proboscis black, with rather dense fine pubescence; palpi bright yellow with numerous short bristles. Occiput narrowly yellowish, a transverse black space behind vertex with two fine black lines running downwards diagonally from it till they meet one another. Head practically bare, with scattered short black bristly hairs on frons, vertex, and occiput.

Thorax pale yellowish brown, with short bristly black hairs; hind margin narrowly black; humeri yellow; pleuræ concolorous, a little yellowish above wing-base; scutellum lemon-yellow, bare except for the four long black bristles (one on each side-margin set a little distant from the edge, and a pair of well-separated apical ones); metanotum concolorous with thorax; traces of a narrow median blackish-brown line. Pubescence of thorax short, uniform, black.

Abdomen with first and second segments united; basal half of the double segment obscurely olive-yellow, with two small well-separated lemon-yellow dot-like spots at extreme base; apical half of double segments more ferruginous-brown, with a blackish transverse line and a narrow yellow line in front of it, placed across the middle of the double segment *. Third segment only one-quarter as long as second (*i. e.*, apical half of double segment), fourth, fifth, and sixth very short, yellow, subequal, obscurely reddish brown with narrow ill-defined yellowish hind margins. Venter blackish. Genitalia large, conical, ferruginous-brown, a little darker at base, about as long as the long double segment, with only a little short fine pubescence.

Legs uniformly ferruginous-brown; coxæ rather obscurely greyish; a very small pale yellow space at tip of under side of all femora. Pubescence of legs black.

Wings of normal width; pale grey; a dark grey spot towards wing-tip with well-defined inner sides, reaching downwards to a little below third vein and extending inwards as far as appendix of second vein. Stigma indistinctly darker than disc of wing; base of third vein shortly blackish infuscated, costal cell pale yellowish.

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* Probably, morphologically the yellow band represents the hind margin of the first segment and the black one the base of the second.

Halteres all yellow.

Length about 9 mm.

One ♀, S. Rhodesia, Hope Fountain, 1. xii. 1921 (*N. Jones*) (Rhodesia Museum).

Near *A. latipennis*, Walk., but the wings not exceptionally broad.

Sepsidæ.

Sepsis posterolineata, sp. n.

♀.—*Head.* Occiput, vertex, and frons orange-brown, latter with bluish reflections; antennæ orange; face light brownish yellow with whitish reflections seen from above; proboscis brownish yellow. Two fairly strong oral bristles, remainder merely stiff hairs.

Thorax light brownish yellow: a moderately narrow whitish-yellow side-stripe, with very narrow brown edges running from humeri to wing-bases. A pair of wide blackish-brown stripes from sides of base of scutellum extending to lower part of mesonotum. Two dorsocentral bristles (hindmost), two notopleural, one post-humeral, placed well back on side-margin of dorsum, one præ-alar, one supra-alar, one mesopleural, one scutellar (apical) bristle.

Abdomen brownish yellow in ground-colour (apparently), but considerably blackish; first segment all black, second and third on apical half and most of the dorsum on the remainder blackish, but yellowish at sides. Venter brownish yellow, hind margins of segments narrowly blackish. Second abdominal segment with a perpendicular row of three bristles on sides and one or two more behind them; third, fourth, and fifth segments with (probably) four bristles in a row a little before hind margin. Abdominal pubescence short, bristly.

Legs all pale brownish yellow; front legs pale yellow; posterior femora black on upper side towards tips; fore tarsi all black, tips of posterior tarsi blackish. Hind femora with two or three medium-sized bristles on upper side near tip; posterior tibiæ with three or four apical bristles; hind tibiæ with a subapical one on hind side and one in middle of outer side.

Wings uniformly pale grey. Tips brownish, infuscated narrowly but quite distinctly, yet without well-defined edges, from just before tip of second vein to tip of fourth vein.

Halteres pale yellow.

Length 5 mm.

One ♀, Uganda, Kampala, 2. ix. 1918 (*C. C. Gowdey*).

The chætotaxy given is probably incomplete, as the unique type is not quite perfect.

Sepsis zanzibarensis, sp. n.

♂.—*Head* bright brownish orange; ocelli yellowish, each set on a small black dot; a brownish streak on occiput from upper corner of each eye towards centre. Bristles normal; oral bristles moderately long preceded by one or two and followed by several shorter bristly hairs.

Thorax bright brownish orange; scutellum more yellowish. Three dorsocentrals, all behind suture, front one weak; in front of these a row of minute bristles extends to the anterior margin; two rows of minute acrostichals between the dorsocentral rows for nearly whole length of dorsum. One humeral bristle, two notopleural, one supra-alar, one post-alar bristle, all strong. A row of minute bristles on outer side of dorsocentral row in neighbourhood of wing-bases, with a shorter additional row still nearer to margin of dorsum. One strong mesopleural bristle in upper hind corner; apical scutellars strong, a very weak one in middle of side-margin. Pleuræ with some greyish-white reflections.

Abdomen bright brownish orange; second and third segments brownish posteriorly, fourth nearly black, with anterior corners rather broadly bright red passing over sides of segment and spreading broadly over venter; fifth segment with blackish sides, disc nearly filled with a shining yellowish dust-spot which extends over hind part of fourth segment. Second segment with a perpendicular row of three bristles on each side with two or three smaller ones behind them; third, fourth, and fifth segments each with a row of four bristles placed on the last quarter of each segment. Genitalia brownish yellow; a pair of obtuse conical claspers (with a strong bristle on the outer side of each at base and a finer bristle below them) broad basally and with very pointed tips. Venter pale yellow.

Legs bright reddish orange, tarsi obscurely yellowish, last two joints black. Fore femora considerably incrassate, with sparse fine bristles on upper side and three or four longer ones on apical half; on under side a conical peg just beyond middle and three spines just before it (fore tibiæ too tightly closed on femora to observe vestiture). Middle femora with a bristle in middle of front side and a row of about five towards tip; middle tibiæ with three in middle half of hinder side (*i. e.*, one on front, one on inner, one on outer side); also three or four apical bristles. Hind femora with three close together on outer side, well before tip; about three weak ones on under side on middle half; hind tibiæ with one on front, one on hinder, and two on outer side, all placed on middle half, also a subapical one on outer side and two apical ones on front side.

Wings pale grey, nearly clear; a perceptible narrow blackish suffusion over tip of second vein; the wing-tip appearing whitish when viewed from base at a low angle.

Halteres orange, small.

Length 4 mm.

One ♂, Zanzibar, i.–ii. 1925 (*H. J. Snell*).

Sepsis natalensis, sp. n.

♂.—Very like a small-sized *S. zanzibarensis*, but the armature of the front femora quite different. The middle pair of bristles on the third, fourth, and fifth abdominal segments absent; a large oval black spot covering about apical half of third segment, and nearly all fourth segment. Genitalia with a strong bristle on outer side of each clasper near base. Two subequal oral bristles; bristly hairs below them as in *S. zanzibarensis*.

Legs bright brownish orange. Fore femora distinctly incrassate in middle on under side, with four spines before the middle, the distal one the largest; a small conical peg just beyond them bearing three smaller tooth-like spines; also two definite spines immediately before the peg; a second, smaller and more cylindrical, peg just beyond first one. Middle femora with a row of stiff bristly hairs, a strong bristle in middle of them, on under side; middle tibia with three bristles in middle of hinder side and one at middle of inner side. Hind femora with one on outer side towards tip; hind tibiæ with two beyond middle on outer side.

Length about 2¼ mm.

In all else as in *S. zanzibarensis.*

One ♂, Natal, Weenen, iii. 1925 (*H. P. Thomasset*).

Sepsis unicoloripes, sp. n.

♂ ♀.—*Head* reddish orange, a little blackish about mouth-opening, with bristly hairs on oral margin; two strong oral bristles, a rather smaller one above and below, and a row of finer bristles or bristly hairs. Head-bristles normal.

Thorax all reddish orange including metanotum. One humeral bristle, one supra-alar, one post-alar, two dorsocentral (hindermost), two notopleural, one mesopleural, one scutellar. A little whitish-grey dust reflection above middle coxæ.

Abdomen orange-brown, irregularly blackish in parts; third and fourth segments with four bristles, fifth with middle pair absent.

Legs all orange to tips of tarsi. Fore femora with a small definite swelling at middle of under side preceded by a single strong spine, the swelling bearing four short spines and followed by a narrow cylindrical peg. Some stiff hairs at base of under side. Fore tibiæ a little widened before middle on hinder side, after which it is narrowed, slightly widening again towards tip, the broadened basal part with a row of stiff short bristly hairs. Middle femora with two bristles at middle of front side; middle tibiæ with one at about middle of inner side and one just above and below it on hinder side, with three or four apical bristles. Hind femora with two on outer side towards tip; hind tibiæ with one on outer and two diverging ones on hinder side, all a little below the middle; a weak subapical bristle on hinder side, and two strong proximal ones on front side of metatarsus.

Wings very pale grey.

Halteres pale orange.

Length 3 mm.

Two ♂♂, one ♀, Gold Coast, Aburi, 1912–13 (*W. H. Patterson*).

Sepsis rufa, Macq.

Several specimens of both sexes from Natal, Weenen, xii. 1923; i.–ii.–x.–xii. 1924; iii. 1925; i. 1924 (Thorn country) (*Thomasset*). There is little doubt of the identity of the species, which extends as far north as Egypt and as far east as India. The oral bristles are conspicuous and spinous, four stronger ones on each side and a row below them of finer ones or bristly hairs. The fore femora have, in the ♂, a row of five subequal and equidistant strong spiny bristles (the first at middle of femur), also a single bristle a little beyond end of the row; another one beyond base. All these bristles form a row on inner side. A shorter outer row of smaller ones rather beyond middle of limb, with one or two isolated at each end.

Sepsis definita, sp. n.

♂ ♀. *Head* black, barely shining; antennæ and face, mouth-region, and proboscis all more or less brownish yellow, but variable; lower half of occiput yellowish. Bristles normal; about six, sometimes more, on oral margin, including two or three strong ones on each side.

Thorax black, barely shining; side-margin of thorax sometimes narrowly, sometimes broadly, pleuræ practically entirely brownish yellow. Scutellum generally black, sometimes more or less brownish yellow; metanotum brownish yellow with a median black stripe. A more or less complete grey dust-stripe on upper part of sternopleura sometimes reduced to a triangular spot above middle coxæ. No dorsocentral, one humeral, one supra-alar, one post-alar, two notopleural, and one scutellar bristle.

Abdomen very shining black; second segment sometimes broadly yellowish at base, or on anterior corners only, third also sometimes on anterior corners. Third and fourth segments with four bristles, fifth with outer pair only. Venter black, broadly yellowish apically.

Legs yellowish, posterior femora sometimes mainly blackish above, the colour more or less continued over sides; hind tibiæ black or blackish, middle tibiæ also often so on basal half. Fore femora in male with a peg about the middle with four short spines, preceded by a single spine; fore tibiæ a little swollen beyond base, bearing short spines there. Middle femora with a row of bristly hairs below and a spine at middle of front side; middle tibiæ with a bristle below middle on inner side, one at the middle, and one in the distal quarter on hinder side. Hind femora with one at three-quarters of its length on upper side; hind tibiæ with one on front and one on outer side both about the middle. Bristles in ♀ much reduced, possibly practically absent. (Legs in bad condition.)

Wings clear; about basal half of costal cell black.

Halteres conspicuous, bright yellow.

Length about 3 mm. Described from several of each sex, many in inferior condition, from Natal, Weenen, iii.–iv. 1924, iii. 1924, iv. 1924; 2840 ft., thorn country, i. 1924; ii.–iii. 1925 (*H. P. Thomasset*). The species should be near *S. delectabilis*, Adams, from Rhodesia, and is easily recognizable.

Sepsis quadratipunctata, sp. n.

♂ ♀. *Head* mainly brownish yellow; vertex and frons from dark brown to black; occiput blackish; oral margin with three strong bristles, of which middle one is the longest also a row of seven or eight rather fine well-separated bristles Head-bristles normal.

Thorax moderately shining black; sternopleura with whitish grey-dusted band complete and conspicuous. One humeral bristle (almost post-humeral), two dorsocentral, one supra-alar, two notopleural, one mesopleural, and one scutellar.

Abdomen shining black with violet reflections, especially basally, no signs of pale spots.

Legs black: front coxæ considerably or wholly, posterior coxæ more or less brownish yellow; fore tibiæ and all tarsi more obscurely so, the pale colour varying a little in extent. Fore femora with a slight swelling on under side at middle with five short spines, the middle one much the longest; also a single strong spine both before and beyond the swelling. Middle tibiæ with a bristle below middle on inner side and two on hinder side, placed respectively at middle and distal end of limb. Hind tibiæ with one at middle of outer side (a little towards hinder side) *.

Wings clear; a small, generally squarish, black spot over tip of second vein, not altogether constant in shape.

Halteres pale yellow, conspicuous.

Length 2–3 mm.

Described from 4 ♂ ♂ and 4 ♀ ♀, in fair condition (except for missing bristles), from Natal, Weenen, iii.–iv.–v. 1924 (*H. P. Thomasset*).

It should be near *S. propinquus*, Adams, from Rhodesia, but the latter has two bristles on all the tibiæ, which are almost certainly not present in the present species. *S. propinquus*, Adams, also has "the large vein at base of wing swollen, bordered with brown," which is not the case here.

Sepsis longisetosa, sp. n.

♂ ♀. *Head* reddish yellow to brownish yellow; vertex, frons, mouth-opening, proboscis, and occiput blackish, to a varying degree in individuals. Bristles normal. Oral margin with three strong bristles and a few smaller ones.

Thorax. Dorsum dark greyish black, only a little shining; sternopleuræ with complete whitish-grey dust-stripe. Two dorsocentral bristles, one humeral, one præ-alar, one long supra-alar, one small post-alar, two notopleural, one scutellar.

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* Only the bristles observed are recorded. There are obviously some broken off.

Abdomen shining black with purplish, sometimes violet, reflections. Outer pair of bristles present on third, fourth, and fifth segments, and an inner pair as well on fourth segment. (Bristles mainly missing.)

Legs. Front pair all brownish yellow except tips of tarsi, blackish; posterior coxæ brownish yellow, posterior femora for a varying distance proximally similarly coloured; remainder of femora shining black. Posterior tibiæ generally more or less brownish yellow apically. Fore femora with a distinct bump below in central region bearing three, perhaps four, rather short spines; a strong spine on a small cylindrical peg before the bump, and a row of seven strong rather long subequal equidistant bristles between bump and tip of limb. (Bristles of legs mainly missing.)

Wings clear, a distinct roundish black spot at tip of second vein.

Halteres pale yellow.

Length 2–2½ mm.

Described from 1 ♂ and 4 ♀, Natal, Weenen, xii. 1923–i. 1924, type ♂, iii.–iv. 1924, type ♀; iii. 1925; 2840 ft., i. 1924 (*H. P. Thomasset*).

This species is near *S. petulantis*, Adams, from Rhodesia, but appears to differ essentially in having three strong oral bristles, which in Adams' species are replaced by a fringe of short hairs. In that species also the legs are more extensively yellow and there is a second wing-spot at base of first vein. The middle pair of submarginal bristles on the fourth abdominal segment are not mentioned by Adams, but they are present in *S. longisetosa*.

Sepsis setosipes, sp. n.

♂. *Head.* Vertex and frons moderately pale brownish, a broadly blackish triangular space on ocellar region, and a very narrow black line contiguous with eye-margins on upper part of frons. Antennæ brownish yellow, upper side much darker. Face, proboscis, and mouth-opening yellowish; lower part of head blackish.

Thorax greyish black; humeri mainly reddish yellow; sternopleuræ blackish with a blue-grey dust-stripe, remainder of pleuræ reddish yellow. One humeral bristle, two notopleural, one pre-alar, one supra-alar, one mesopleural, one scutellar. (Dorsocentral broken off.)

Abdomen shining black; sides of second and third segments, tip of abdomen and genitalia, broadly yellowish;

third and fourth segments with four bristles, fifth segment with only one outer pair present (damaged).

Legs brownish yellow; a short brownish streak on apical half of upper side of hind femora. Hind tibia brownish on basal half. Fore femora with two very weak bristles beyond middle of upper side; under side with a swelling at middle bearing four divergent spines, with three spines before them and four others beyond the swelling; also a strong isolated bristle towards base. Fore tibiæ (apparently) with short bristly hairs on basal half *. Middle femora with four bristles on apical half of under side and one on upper side near tip; middle tibiæ with one at middle on inner side and two on hind side (one above and one below middle); three or four apical bristles. Hind femora with two rather weak ones towards tip on upper side; hind tibiæ with two diverging ones on outer side at about middle, also one on front side, a little below the middle.

Wings clear; a roundish black spot at tip of second vein.

Halteres pale yellow.

Length 2½ mm.

One ♂, Natal, Weenen, iii.–iv. 1924 (*H. P. Thomasset*).

Micropezidæ.

Telostylus nigripes, sp. n.

♀. *Head* black; tip of frons reddish orange, the colour continued upwards in narrowed form for a short and varying distance; side-margins of frons and sometimes the inner margins of the eyes themselves narrowly but conspicuously yellowish. Antennæ black. Epistome blackish with whitish dust, mouth-opening, lower part of head, and occiput brownish yellow; proboscis and the long cylindrical slender palpi brownish yellow, nearly bare. A large patch of whitish dust each side on lower part of occiput.

Thorax black; a broad whitish-grey dust-stripe, about one-third width of thorax, running from anterior margin of dorsum to tip of scutellum. Upper margins of pleuræ broadly yellowish, more or less white-dusted. Metanotum shining black, bare.

Abdomen. Ground-colour blackish, central portion mainly reddish or brownish yellow, sometimes with a row of small black indistinct dorsal spots, sometimes with a fairly definite narrow median dark stripe. Venter reddish yellow, side-margins and tip more or less blackish. The rather long ovipositor (about 1½ mm.) curled under the venter.

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* Too closely folded on femur to observe satisfactorily.

Legs black, outer side of fore coxæ yellowish; front side of fore coxæ with a row of five or six strong spines, fore femora on under side bearing about twenty uniform small spines; hind femora with a few weak ones below at tip; all tibiæ with two apical spurs.

Wings pale brownish yellow, narrowly blackish from costa to second vein.

Halteres yellowish.

Length 6–6½ mm.

Described from several specimens, Nigeria, Ibadan, 20. vii. 1923, type ♀; Sierra Leone, Kennema, 16. xii. 1924 (*E. Hargreaves*); Gold Coast, Aburi, 1921 (*W. H. Patterson*); Southern Nigeria, Agege, 14. viii. 1913 (*Dr. W. A. Lamborne*).

The specimens are not in the best condition and perhaps some of the bristles may be missing, but they appear to be as follows: one vertical, one post-vertical, two upper fronto-orbital, one supra-alar, one post-alar, two dorsocentral, the two hindmost, of which the front one is small, two notopleural, one strong apical scutellar, and one weak marginal one.

Telostylus uniannulatus, sp. n.

♀. *Head.* Frons black, a narrow median reddish stripe, widening considerably above antennæ; sides of frons rather broadly whitish yellow. Face and lower part of head yellowish, broadly shimmering whitish at sides; mouth-opening blackish, proboscis brownish yellow, palpi blackish at tips. Antennæ all black. One vertical, one post-vertical, one very small, and three long fronto-orbital bristles near anterior margin of frons. Occiput wholly yellowish, with whitish reflections, but blackish behind vertex.

Thorax blackish brown, more than middle third yellowish grey, with more or less distinct (always so on anterior margin at least) very dark median stripes superimposed thereon. Side-margins of dorsum and upper part of pleuræ pale yellowish from humeri to wing-bases; rest of pleuræ mainly blackish, grey-dusted towards hind and lower parts and a little yellowish narrowly above front coxæ. Four dorsocentral bristles (1 : 3) all moderately strong, two notopleural, one supra-alar, one post-alar. Scutellum yellowish, one marginal, one apical bristle; two small brown spots on its extreme hinder edge between the apical bristles; lower part of scutellum and the metanotum shining black. Hinder part of metapleuræ with a large round yellow spot.

Abdomen yellowish brown; side-margins and median stripe rather narrowly black. Venter all yellowish, genitalia shining orange-brown.

Legs black or black-brown; fore coxæ all yellowish; a distinct narrow yellowish ring on hind femora just beyond two-thirds of its length; fore coxæ with only a group of spines near tip on front side; posterior coxæ very spiny. The legs appear to be variable in coloration.

Wings yellowish grey, apical part of second vein a little infuscated.

Halteres yellowish.

Length 5 mm.

Described from 3 ♀ ♀ from Zanzibar (*Dr. W. M. Aders*).

Telostylus uniannulatus, sp. n., var. *fascipes*, var. nov.

Two ♀ ♀ which do not appear separable specifically from the typical form show the following variation in the legs. One ♀, Uganda, Entebbe, 20. ix. 1912, has the fore and hind femora brownish yellow, with a black streak on inner and outer sides, interrupted in the middle, the hind femora broadly blackish at tip. In another ♀ (type), from Uganda, Kampala, 17. ix. 1915 (*Gowdey*), the fore femora are yellowish brown with uninterrupted weak blackish streak on inner and outer sides; the hind femora are similar but with the streak on outer side only and uninterrupted, the hind femora tips are broadly black but the colour not clearly outlined.

Sciomyzidæ.

Sepedon senegalensis, Macq., var. nov. *unicolor*.

This specimen appears to be a variety of *S. senegalensis*, Macq., and differs only in the entirely black abdomen, which in Macquart's species has the junctions of the segments whitish. The description as given by Maquart is very inadequate.

Head shining black; a small indistinct brownish spot with a whitish shimmer at certain angles of vision, also a velvet-black spot just above, both contiguous to eye-margins below middle of frons. Antennal first and second joints brownish yellow, second clothed with the usual black bristles, third black, normally shaped, upper side at extreme base yellowish, with yellowish arista changing apically to quite white. Face and part of head mainly shining black, with a little greyish dust; eye-margins up to level of antennæ narrowly shimmering white seen from above; cheeks all brownish yellow, very shining. Occiput black, lower corners shimmering white when seen from certain angles. Proboscis and palpi brownish yellow.

Thorax. Dorsum dull black; pleuræ rather dark ash-grey; scutellum shining black (destroyed by pin); metanotum grey-dusted.

Abdomen only a little shining, pubescence microscopic, black.

Legs. Front coxæ and all femora mainly pale yellow; posterior coxæ black, with whitish dust; femora browner towards tips; hind femora with a distinct broad reddish band on apical half with ill-defined edges; tips of hind femora themselves narrowly black with a short preapical, yellowish, ill-defined ring. All tibiæ and tarsi black to tips, middle tibiæ wholly, a ring beyond middle of hind tibiæ, half of hind tarsi above, indistinctly yellowish brown; pulvilli yellowish, claws black. Leg-bristles mostly missing; two on middle of front side of middle femora, several on apical half of under side of hind femora.

Wings moderately dark grey, darker brown apically as far inwards as level of posterior cross-vein. Anterior and posterior cross-veins barely perceptibly suffused.

Halteres blackish.

Length 6 mm.

Described from a single specimen, Sierra Leone, Mabang, 20. ix. 1924 (*E. Hargreaves*).

II.—*The Mammals of Señor Budin's Patagonian Expedition*, 1927–28. By OLDFIELD THOMAS.

SEÑOR BUDIN'S work in Argentina having still left a very important region—the far south—unworked, it was arranged for him to make an expedition there in the southern summer of 1927–28, and the present paper gives an account of what he obtained.

The expedition was made possible by the generosity of private friends, among whom may be mentioned Colonel Stephenson Clarke and Mrs. Ruxton *, with contributions from the Percy Sladen Trustees, the Trustees of the Godman Memorial Fund, and the British Museum.

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* Mrs. Ruxton's contribution was given in memory of her son, Commander A. E. Ruxton, who did so much good work on the small mammals in the Museum collection.

Señor Budin made his expedition entirely by motor-car, a method of transport which did not prove so successful as had been hoped, so that the total results have not quite come up to expectation. None the less the collection made is a very valuable one, and has settled quite a number of points that were in doubt.

One of the most important results that has come out of my study of these specimens is the fact that the animals discovered by Alcide d'Orbigny, described by Isidore Geoffroy and Paul Gervais, and always hitherto considered as being the far southern representatives of their groups, were not from the far south at all, but from the Lower Rio Negro, to which d'Orbigny made a collecting-trip in 1828. In consequence of this commonly accepted error about the locality of these specimens, some of the most important mammals have had names wrongly given them at more recent dates, while the names based on d'Orbigny's animals have been equally wrongly applied to the allied species from Magellan, where d'Orbigny made no collections.

The local skunk and *Caviella* have thus been wrongly identified, and I am only now able to put matters straight in each case.

An account of d'Orbigny's trip to the lower Rio Negro was given by him in chapter xvii. of the 'Voyage dans l'Amérique Méridionale,' vol. ii. (1839–43), where some of the animals obtained are mentioned—*e. g.*, the skunk (p. 49), which was collected on the Bay of San Blas, between the mouths of the Rio Colorado and the Rio Negro.

In all, the collection consists of about 250 specimens, belonging to 22 species. One subspecies is described as new.

Additional specimens of the rare *Notiomys edwardsi*, *Ctenomys magellanicus*, and, especially, *Notodelphys halli* are among the valuable accessions which we owe to Señor Budin's work.

The localities where Señor Budin collected stretch in a long line down the eastern seaboard, from Bahia Blanca to Punta Arenas, Magellan, especially good series being obtained at Pico Salamanca, Chubut, and Alta Vista, Lago Argentina, Santa Cruz.

1. *Histiotus montanus*, Phil.

♂. 2989. Pico Salamanca, Chubut, 100 m.

2. *Herpailurus geoffroyi*, d'Orb. & Gerv.

♀. 2987. Pico Salamanca, S. Chubut.

Type-locality of *geoffroyi*, Lower Rio Negro.

An unusually pale specimen.

It is not possible to distinguish *salinarum* from *geoffroyi* by the colour, but the difference in size of skull is very considerable.

3. *Conepatus humboldti*, Gray.

♂. 2921; ♀. 2918. La Concepcion, Chubut, 200 m.

♂. 2944; ♀. 2945, 2982. Pico Salamanca, Chubut, 100 m.

♀. 3053. Alta Vista, Lago Argentino, 600 m.

All with the characteristic marking of *humboldti*, in which the white bands unite on the crown and continue backwards on to the base of the tail. This is, indeed, one of the most uniformly marked of all skunks, the variations occurring among our eighteen specimens being very slight. The type, much bleached, is no. 66 *a* of the old catalogue, and is also the type of Lichtenstein's *Mephitis patagonica* *.

The skull is of approximately the same size as in *C. suffocans*—that is to say, about 66 mm. in condylo-basal length in fully adult males.

4. *Conepatus castaneus*, d'Orb. & Gerv.

♀. 2878. Ombucta Railway Station, just S. of Bahia Blanca, about 150 km. north of San Blas.

C. castaneus has always been considered to be the same as the skunk of the far south, and therefore to be a synonym of *C. humboldti*, Gray. But there can be no question that, as indicated both by the type-locality (Bay of San Blas, near mouth of Rio Negro †) and the character of the stripes, as shown in the figure, it is the smaller skunk recently found by Sr. Budin on the Lower Rio Colorado, and, under the then prevailing impression of the identity of *castaneus* with *humboldti*, described by me as *C. proteus gaucho* ‡, the name *gaucho* now therefore becoming a synonym of *castaneus*. The name itself is a little unfortunate, as it is the more southern *humboldti* which tends to be "castaneous," while *gaucho* is usually black. This, however, cannot be helped.

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* Abh. Ak. Berl. 1836, p. 275 (1838).

† *Cf.* 'Partie Historique,' vol. ii. p. 49.

‡ Ann. & Mag. Nat. Hist. (9) xx. p. 203 (1927).

If we then consider this smaller skunk—the Zorrinito, as Sr. Budin calls it—as a single species under the name of *castaneus*, ranging from Cordova to the Lower Rio Negro, and distinguished by a condylo-basal skull-length of about 60 mm. (♂) and 58 (♀), we have then to consider whether the northern and southern forms of it are quite the same subspecies. Laying out the whole series of it available, twenty-three in number, it would appear that the northern specimens, from San Juan and Cordova (and perhaps San Rafael), representing *proteus*, have on the average the white markings much more developed, the white bands usually half an inch or more in breadth, running down nearly to the tail, and quite close to each other or uniting on the crown. On the other hand, in the Rio Negro specimens the bands are much reduced or almost absent, and in no single case is there less than about ¼ inch between their tips. I would therefore provisionally consider the northern and southern races of the Zorrinito as distinct subspecies, the latter taking the name of *Conepatus castaneus castaneus*, d'Orb. & Gerv. (syn. *C. proteus gaucho*, Thos.), and the former would become *C. castaneus proteus*, Thos.

[*Mus musculus*, L.

♀. 3125. Rawson, Chubut.]

5. *Oryzomys magellanicus*, Benn.

Thirteen from Alta Vista, Lago Argentino, 600 m., and two from Punta Arenas, Magellan Straits, 200 m.

A good series of this long-described species, of which all our previous specimens were discoloured or in some way deteriorated, was obtained. The length of the tail is very uniform, markedly shorter than in *O. m. mizurus*, which is, however, hardly, if at all, to be distinguished from the Chilian *O. longicaudatus*. As already hinted in a previous paper*, all these long-tailed field-mice should not impossibly be referred to one single species—*O. longicaudatus*—with a large number of local subspecies, of which the Magellan *magellanicus* and the Madre de Dios *coppingeri* would be the most southern members. The shortness of the tail in the former, and still more the greater size of the latter, may, however, be provisionally considered sufficient reason for keeping them separate for the present.

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* Ann. & Mag. Nat. Hist. (9) xix. p. 369 (1927).

O. magellanicus is one of the most sombrely coloured members of the group, the under surface little paler than the upper.

6. *Reithrodon cuniculoides*, Waterh.

One from Laguna de Berro, Rio Negro; five from Pico Salamanca, Chubut; two from Piedra Clavada, Deseado, Sta. Cruz; fourteen from Alta Vista, Lago Argentino, Sta. Cruz; and one from Rio Perro, Lago Argentino. It seems fairly certain that among these specimens, all of which I should assign to *R. cuniculoides*, there are examples representing Dr. Allen's *R. hatcheri*, of the Rio Chico, whose local distinction appears very doubtful. Sr. Budin unfortunately did not capture at Punta Arenas the form described by Dr. Allen as *R. cuniculoides obscurus*, said to be darker and larger than true *cuniculoides*.

7. *Phyllotis xanthopygus*, Waterh.

♂. 2957; ♀. 2968. Pico Salamanca, Chubut.

8. *Euneomys micropus*, Waterh.

Puerto Prat, Ultima Esperanza, 400 m.

Eight from Alta Vista, Lago Argentino, 600 m., and three from Puerto Prat, Ultima Esperanza, Santa Cruz, 400 m.

9. *Eligmodontia elegans*, Waterh.

Eight from Pico Salamanca, Southern Chubut Territory, 100 m.; ten from Piedra Clavada, R. Deseado, Santa Cruz, 200 m.; and one from the Rio Gallagos, extreme south of Santa Cruz, 50 m.

My attention has recently been drawn to the statement by d'Orbigny and Gervais * that it was from a specimen collected by the former that F. Cuvier's figure of *E. typus* was drawn; also that he obtained it in Corrientes. No doubt Cuvier's giving of Buenos Ayres as the original locality was merely due to this latter term being then used in a general significance—just as if we said Argentina now. We should therefore accept Corrientes as the type-locality of *typus*, and then consider the southern animals as *E. elegans*, Waterh., with type-locality Bahia Blanca, until such time as we have evidence as to the characters of Corrientes *typus*. *E. morgani*, Allen, appears to be a synonym of *elegans*, which extends southwards to Santa Cruz. Specimens from Neuquen and Pilcaneu, Upper Rio Negro, are quite similar to the type of *E. elegans*, and my *E. morgani pamparum* is also presumably the same animal.

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* Voy. Am. Mer. iv., Mamm. p. 24 (1847). Not Gervais's better-known publication under Castelnau's direction.

The amount of grey on the bases of the hairs of the underside is exceedingly variable, but it averages greater in more southern specimens, less in northern.

10. *Abrothrix hirta nubila*, subsp. n.

♂. 3036, 3037, 3045, 3062, 3064, 3065, 3073, 3075, 3100, 3105.

♀. 3044, 3046, 3052, 3063, 3086.

Estancia, Alta Vista, Lago Argentino, 600 m.

To commence with, I may note, as already indicated in a previous paper, all the small forms of *Abrothrix* from the east side of the Andes, from San Rafael, Mendoza, southward to Southern Patagonia, evidently pass into each other, and should be placed under the earliest name—*A. hirta*, Thos.

Then we have in succession:—

A. hirta hirta. Paler grey, with slight wash of buffy on back.—Mendoza and Neuquen.

A. hirta mœrens, Thos. Darker, almost blackish, grey. —Saturate region near L. Nahuel Huapi.

A. hirta suffusa, Thos. Clear grey, slightly darker than in *hirta*, the back with decided buffy wash. (Syn. *A. suffusa modestior*, Thos.)—Patagonia, along the eastern side of the Andes from Maiten, Chubut, to the Rio Chico, about 48° S. Type from the Koslowsky region, 46° S., and that of *modestior* from Maiten, 42°.

Then follows the present subspecies, the most southern of the continental forms.

Size as in *hirta*, therefore smaller than in *longipilis*, *illutea*, and *francei*. General colour above dull drabby grey, with but very little buffy wash on the back, though there is more than in the dark brown *illutea*. Sides dull greyish; belly washed with whitish. Line of demarcation not sharply marked. Feet whitish. Tail bicolor, not sharply defined.

Skull as in *suffusa*.

Dimensions of the type:—

Head and body 112 mm.; tail 77; hind foot 23·3; ear 15·5.

Skull: greatest length 28·7; condylo-incisive length 26; breadth of brain-case 12·8; nasals 11·5; palatilar length 12; palatine foramina 6; upper molar series 4.

Hab. as above.

Type. Adult female. B.M. no. 28. 12. 11. 76. Original number 3052. Captured 25th February, 1928.

This subspecies, the most southern of all, is no doubt nearly allied to its neighbour next to the north—*A. hirta suffusa*,—but is distinguished by its dull smoky or drabby grey colour, with much less of the characteristic buffy wash on the back.

With regard to the most northern *Abrothrix*—*A. illutea*,—described from Concepcion, Tucuman, I have been surprised that, in spite of all Mr. Shipton's efforts, he has never succeeded in obtaining it again, and doubt about its validity began to creep in. Now, however, his collector Mr. Morgensen has captured four further specimens on Aconquija at 3000–4000 metres, and I think there is no doubt that the original specimen was also obtained at that altitude, where he had previously made collections, and that it does not occur at the low-level Concepcion at all. This is also far more in conformity with the occurrence of such a southern animal as *Abrothrix* at an altitude where one might reasonably expect southern forms to occur, which is not the case at Concepcion.

11. *Akodon iniscatus*, Thos.

Three from La Bombilla, Rio Negro; seven from Laguna del Barro, Rio Negro; eight from Rawson, Chubut; four from Concepcion, Chubut; and nine from Pico Salamanca, Chubut.

The whole of Sr. Budin's eighty-four Akodons appear to belong to the two species *A. iniscatus* and *A. xanthorhinus*, of which the first ranges southwards to Pico Salamanca, while the latter overlaps it from the Rio Negro. *A. iniscatus* was described from Koslowsky, just about level with Pico Salamanca.

I am now fairly satisfied that *A. canescens* should be united with *A. xanthorhinus*, as specimens occur in the Rio Gallagos series showing various stages between the greyish coloration of *canescens* and the more buffy colour of true *xanthorhinus*, while topotypical *xanthorhinus* from Tierra del Fuego may be exactly matched by continental examples from Koslowsky. On the whole, however, the specimens from Rio Gallagos certainly average darker and more buffy than those from Pico Salamanca, the latter being particularly "*canescens*," but whether the difference is seasonal or local I am not at present able to state.

A. iniscatus may be distinguished from *xanthorhinus* by its browner colour, especially below, and its heavier skull with broader interorbital region and broader zygomatic plate, but the whitish chin of the original specimen is but rarely perceptible. The belly of *xanthorhinus* is whiter and the tendency to yellow on the muzzle, feet, and tail is more marked.

In the few immature specimens present of each species the character of the molar notch, as originally described, appears to be confirmed.

12. *Akodon xanthorhinus*, Waterh.

One from Laguna de Barro, Rio Negro (no. 2881); three from Rawson, Chubut; thirteen from Pico Salamanca; two from La Bajada, Lago Argentino, 400 m.; eight from Alta Vista, Lago Argentino, 100 m.; nine from Bella, Vista, Santa Cruz; and eighteen from Rio Gallego, Santa Cruz.

13. *Chelemys vestitus alleni*, Osg.

Notiomys vestitus alleni, Osgood, Field Mus. Publ. xii. p. 124 (1925).

♀. 3057, 3072, 3090. Est. Alta Vista, Lago Argentino, Santa Cruz, 600 m.

Coming from very much the same region, these mole-mice no doubt represent the form from the Rio Chico described by Mr. Osgood as a subspecies of *vestitus*. Their drabby tone suggests that of *Abrothrix hirta nubila*, similarly a local subspecies of an animal found further north at Koslowsky.

14. *Notiomys edwardsi*, Thos.

♀. 2994. Piedra Clavada, Santa Cruz, 200 m.

The first properly prepared and measured specimen yet obtained of this rare and remarkable species described by me in 1892. Its measurements are:—

Head and body 78 mm.; tail 42; hind foot 17·4; ear 6·5.

The excessively small ears, whose minute size had not been previously mentioned owing to the bad condition of the two only known specimens, are a marked characteristic of the animal. They are mere rudimentary lappets, and are covered with white hairs noticeably distinct from the general colour of the animal.

15. *Ctenomys magellanicus*, Benn.

♀. 3108. Rio Perro, N. end of Lago Argentino, Santa Cruz.

A very valuable specimen, as this species has become very rare—indeed, almost extinct,—while such examples of it as have been preserved are now much deteriorated. Indeed, this is the only perfect specimen that I have seen. The British Museum contains Brunetti's type, received from the Zoological Society's Museum (B.M. no, 55. 12. 24. 198), a spirit-specimen from Port Gregory, Magellan, collected by Dr. R. O. Cunningham, another from the same place presented by the Marchese G. Doria, and two excellent skulls from Punta Arenas, also received from the Museo Civico, Genoa.

It is worthy of note that the type, nearly a century old, is of almost precisely the same colour as Sr. Budin's beautiful fresh specimen, and matches it closely in every respect.

Nehring's *C. neglectus* * is unquestionably synonymous with *C. magellanicus*, the drawing he gives of the skull showing that this agrees precisely with our examples of the old species, while it is not so long and narrow as the skull of *C. osgoodi*. He seems to have given a disproportionate importance to the concavity on the upper side of the zygoma, which happened to have been unusually well developed.

Sr. Budin states that this species is now almost exterminated, owing to the fact that the introduced sheep, by piercing with their pointed feet the crust of snow above the burrows, have caused the death of the tuco-tucos by the resulting wet and cold thus allowed to enter.

16. *Ctenomys mendocinus recessus*, Thos.

Six from Estancia Viticola, Bahia Blanca.

17. *Ctenomys sericeus*, All.

Six from Laguna de Barro, Rio Negro; one from San Antonio del Oeste, Rio Negro; two from Aguarda Cecilio, Rio Negro; five from Rawson, Chubut; thirteen from Concepcion, Chubut; ten from Pico Salamanca, Chubut; and four from Descado, Santa Cruz.

With the exception of the one very valuable specimen of *C. magellanicus* above recorded, the whole of the tuco-tucos obtained by Sr. Budin south of the Rio Negro appear to belong to but a single species, for which Dr. Allen's name of *C. sericeus* is available. But whether it should be considered as a special species, or whether, as I am now tempted to think, it grades into *C. mendocinus*, whose wide distribution has been already noted, I am not at present prepared to say. And again, on the east—in Buenos Ayres—it would seem to grade into *C. talarum*, whose name dates from 1898.

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* Zool. Anz. xxiii. p. 535 (1900).

Indeed, the specimens from Bahia Blanca have been already given the name *C. talarum recessus*, which I should now call *C. mendocinus recessus*, retaining the name *sericeus* for the tucos from south of the Rio Negro.

Within the vast area—from Mendoza to Santa Cruz—occupied by the *mendocinus* group there are certain other isolated forms, larger than *mendocinus*, smaller than *magellanicus*—such as *colburni*, *porteousi*, and *emilianus*,—but the relation of these to the smaller forms is still very doubtful.

18. *Galea littoralis*, Thos.

♀. 2892. Laguna de Barro, Rio Negro, 100 m.

G. negrensis is probably not distinguishable from *G. littoralis*, which was based on a young specimen.

19. *Caviella australis*, Geoff. & d'Orb.

Three from Rawson, Chubut; three from Pico Salamanca, Chubut; three from Las Heras, Deseado, Santa Cruz; and eight from Lago Argentino, Santa Cruz.

The original specimens of *australis* were obtained on the Lower Rio Negro by d'Orbigny, not from the far south of Patagonia as has been erroneously supposed hitherto. In consequence, what I called *C. a. nigriana* is the true *C. a. australis*, while the far southern form, previously called by the latter name, should, if distinct, bear the title of *C. a. kingi*, Benn., type-locality Port Desire; type-specimen B.M. no. 55. 12. 24. 129. The differences between the local races of *C. australis* are set out in Ann. & Mag. Nat. Hist. (9) vii. p. 445 (1921), but so large a proportion of the available specimens are immature, and there is so much variability in the size of the bullæ, that I am still in doubt whether *kingi* should or should not be recognized as distinct subspecifically from true *australis*. Some of Sr. Budin's Lago Argentino specimens representing *kingi* are very fine, one especially having the occipito-incisive length no less than 54·6 mm.

20. *Dolichotis magellanicus*, Kerr.

♀. 2879. Laguna de Barro, mouth of Rio Negro, 100 m.

My attention has been drawn to the gender of the word

Dolichotis, and the consequent ending of the specific name of the animal. While it might be considered as neuter (from *οὖς, ὠτὸς*, an ear), I fail to see any sufficient reason for treating it as feminine, and would prefer to consider it as a masculine adjective used as a generic name.

And the same would apply to a multitude of other names ending in "*-otis*."

21. *Zaedyus pichiy*, Desm.

♀. 2914. La Concepcion, Chubut, 200 m.

The skull of this little armadillo measures 68×42 mm., which is about the normal in *pichiy*, the small Mendoza race recently described having these dimensions about 63×41 mm.

22. *Notodelphys halli*, Thos.

Ann. & Mag. Nat. Hist. (9) viii. p. 136 (1921).

♂. 2972; ♀. 2943, 2953, 2990, and a female in spirit. Pico Salamanca, 100 m.

A most interesting capture, as Sr. Budin has recognized. The type was obtained about 1920 by Mr. T. H. Hall, who has lately written to me in regard to it:—"The opossum was caught on the Estancia Madujada, not far from Puerto Deseado, in full winter, about the beginning of July, at a trap set for foxes. It had eaten its fill of the rhea meat hung up as bait about 2 feet from the ground, and then jumped straight down on to the trap." This eating of bird-meat, and the adjective "ferox" applied to the animal in Sr. Budin's collecting-list, both indicate that the deductions I made from its skull and dentition as to its predaceous character were not far from the truth.

On the spirit-specimen it is possible to see that the mammæ are no less than 9—1—9=19, a number just equalled by some specimens of *Marmosa elegans pallidior* obtained by Sr. Budin in Neuquen, but otherwise much beyond anything hitherto recorded among these small opossums.

Owing to the specimens having been collected in full summer (December), they are slightly bleached and show less of the *Marmosa elegans* marking—the dark back and grey sides—than the original type. One is in changing pelage, the fore back paler grey, the hind back browner.

These examples are all somewhat older than the type, with more worn teeth. The skulls are in consequence slightly larger—greatest length 33 mm., zygomatic breadth 21·5,—and their predaceous look is intensified.

III.—*A new Species of* Dujardinia (*Nematoda*) *from Crocodiles*. By H. A. BAYLIS, M.A., D.Sc.

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AMONG a small collection of parasitic worms kindly forwarded to the writer for identification by Dr. H. Schouteden, Director of the Musée du Congo belge, Tervueren, there were two tubes containing Ascarids from the intestines of crocodiles. These were collected by Dr. Van den Branden at or near Léopoldville, Belgian Congo. The material, in one case, came from *Crocodilus cataphractus*, and in the other from *Crocodilus niloticus*. The species to be described in this paper occurred in both hosts. In *C. cataphractus* it was accompanied by *Dujardinia helicina* (Molin, 1860) and *Multicæcum agile* (Wedl, 1862), and in *C. niloticus* by *M. agile* only. Both these forms have been redescribed by the writer (1923). *Crocodilus cataphractus* seems to be a new host for them.

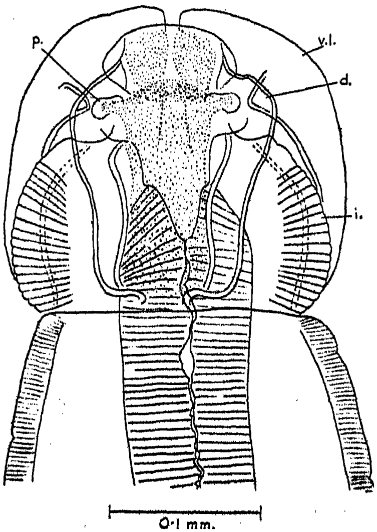
Dujardinia vandenbrandeni, sp. n.

The males of the new species measure 18–22·3 mm. in length and 0·68–0·88 mm. in maximum thickness. The only large female (from *C. cataphractus*) is about 63 mm. long and 1·3 mm. in maximum thickness. The length of two smaller, though apparently mature, females from *C. niloticus* could not be satisfactorily measured, owing to their tightly coiled condition.

The interval between the cuticular striations on the body is about 4·2 μ in the male and 5 μ in the large female. The lips (fig. 1) are marked off from the neck by a constriction, and are elongate and narrow. The dorsal lip has two anterior pulp-processes, which do not appear to be bifurcated like those of *D. helicina*. The interlabia are relatively very large, and their cuticle is marked with coarse transverse striations. The distance from the anterior extremity to the posterior end of the œsophagus (including the small posterior bulb) is 3·7–4·3 mm. The maximum width of the œsophagus is 0·11–0·13 mm. in the male and 0·31 mm. in the female. The bulb measures about 0·13 mm. in diameter in the male and 0·25 mm. in the female. The voluminous intestinal cæcum extends forward to a point 1·17–1·4 mm. from the anterior extremity. No cervical papillæ were seen. The nerve-ring is situated at 0·6–0·7 mm. from the anterior end in the male and 0·8 mm. in the female. The excretory pore is at 0·55–0·63 mm. from the anterior end in the males; its position in the female was not made out.

The tail in both sexes is rapidly tapering and sharply pointed. In the male it is 0·22–0·3 mm. long. The spicules measure 1·1–1·4 mm. in length. They have a slender, tubular shaft, somewhat expanded at the basal end. This shaft is bent at an obtuse angle at a little distance from its base, and at about the same point a pair of alæ originate. These are apparently folded inwards, giving the whole spicule a tubular appearance. Distally the alæ become very delicate and membranous, and disappear some distance from the tip of the shaft, the terminal portion of which is simple and sharply pointed. The accessory piece (fig. 2, *a.p.*, and fig. 3), which measures 0·2–0·22 mm. in length, is of the same general shape as in other species of *Dujardinia*. It has a simple, sharp point distally, like that of *D. woodlandi*, Baylis, 1923. The solid expansion at the proximal end is somewhat variable in shape. There are nine pairs of caudal papillæ, of which four are preanal and five postanal. These are arranged as

Fig. 1.

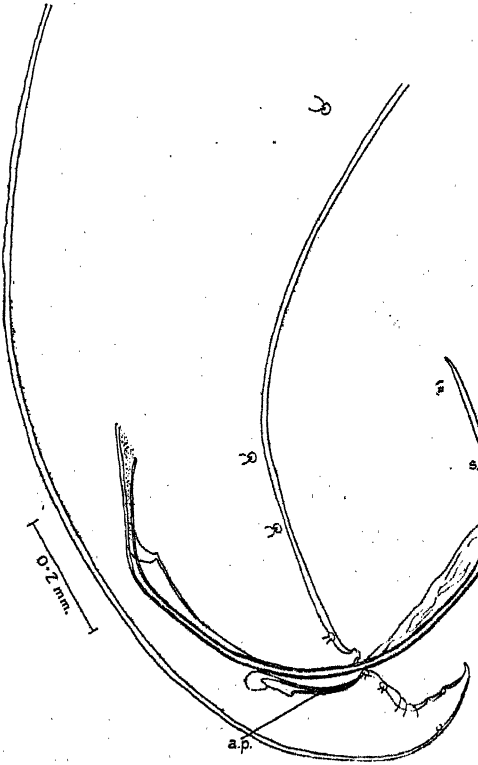


***Dujardinia vandenbrandeni*, sp. n. Anterior end of male; dorsal view. *d.*, dorsal lip; *i.*, interlabium; *p.*, papilla; *v.l.*, ventro-lateral lip.**

shown in fig. 2. There appears to be also a median papilla on the anterior lip of the cloaca.

The tail of the large female is 0·56 mm. long. The vulva is situated at 23·5 mm. from the anterior end, and is very inconspicuous. It has not been possible to study the details of the female genital apparatus. The eggs, as seen in the uterus of one of the small specimens from *Crocodilus niloticus*, are nearly spherical, and measure 0·082–0·09 mm. in greatest diameter.

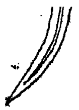
Fig. 2.



Dujardinia vandenbrandeni, sp. n. Posterior end of male; lateral view. *a.p.*, accessory piece; *s.*, right spicule (the left spicule is not shown).

Gedoelst (1916) described, under the name of *Ascaris nigra*, two immature female specimens from a crocodile from the Belgian Congo. Though recognizing its close relationship to *D. helicina*, Gedoelst did not refer *A. nigra* to his new genus *Dujardinia*. The present writer (1923), however, did so provisionally, on the basis of Gedoelst's description. Through the kindness of Dr. Schouteden the writer has now had the opportunity of examining the specimens in question, which are the property of the Tervueren Museum, and is able to confirm the view that they represent a species of *Dujardinia*. Owing to their immaturity and rather poor condition, however, it is impossible to determine definitely whether or not they may be specifically identical with the form now described. In the circumstances it has been thought advisable to regard the latter as a new species.

Fig. 3.



Dujardinia vandenbrandeni, sp. n. Accessory piece; lateral view.

Co-types will be deposited in the British Museum (Natural History) and in the Musée du Congo belge, Tervueren.

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IV.—*On the Hosts of* Camallanides prashadi, *Baylis & Daubney*, 1922 [*Nematoda*]. By H. A. Baylis, M.A., D.Sc.

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In the original description (Baylis and Daubney, 1922 *) of this species only one host was mentioned—the banded krait (*Bungarus fasciatus*). Subsequently † the same authors recorded its occurrence in the rat-snake (*Zamenis mucosus*). Dr. P. A. Maplestone, of the School of Tropical Medicine and Hygiene, Calcutta, has recently drawn the writer's attention to the fact that the material upon which the 1922 report was based, part of which is in the Indian Museum, Calcutta, included one set of specimens from "*Naja bungarus*." This is perfectly correct, and these were, in fact, the actual type-specimens, two of which had been deposited in the British Museum (Natural History) under the wrong host-name. Through some confusion between the names *Naja bungarus* and *Bungarus fasciatus*, the former was inadvertently omitted from our report. The hosts in which the species is at present known to occur are, therefore, the following:—

Naja hannah (Cantor, 1836) (synonym, *N. bungarus*, Schlegel, 1837).
Bungarus fasciatus (Schneider, 1801).
Ptyas [*Zamenis*] *mucosus* (L.).

V.—*A Synoptic Classification of the False Scorpions or Chela-spinners, with a Report on a Cosmopolitan Collection of the same.*—Part I. *The Heterosphyronida* (Chthoniidæ) (*Archnida-Chelonethida*). By Joseph Conrad Chamberlin, A.B., M.A., Stanford University, California, U.S.A.

1. INTRODUCTION.

This paper epitomizes a portion of the results of several years' intensive study on the classification of the arachnid order Chelonethida (Pseudoscorpionida).

The present contribution deals with members of the family Chthoniidæ, which, as investigation has clearly demonstrated, is equivalent, systematically speaking, to all other false scorpions. It is here given subordinal rank under the name Heterosphyronida. Members of the two remaining suborders, which it is expedient simultaneously to erect, will be dealt with in two subsequent papers of this same series. Unless otherwise specifically designated, all types and other material are in the author's, at present private, collection.

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* Mem. Ind. Mus., Calcutta, vii. 4, pp. 263-347.

† Rec. Ind. Mus., Calcutta, xxv. 6, pp. 551-578 (1923).

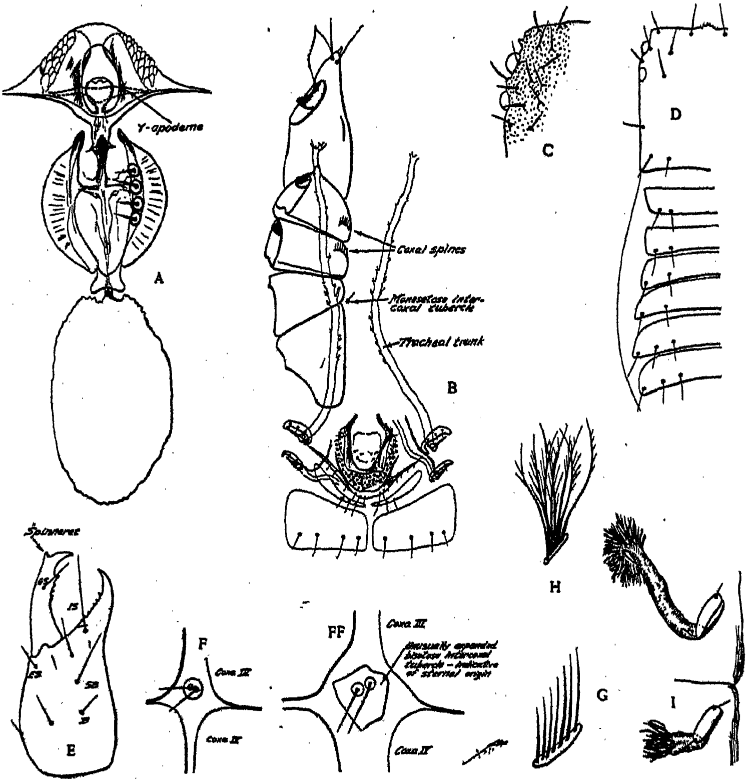
The morphological results, together with their more general and historical implications accumulated as a result of this study, are at present in process of synthesis, and will be published in another form. The terminology employed has been established by past usage for the most part, although principally in scattered publications. It is clarified and illustrated sufficiently for purely taxonomic purposes in the accompanying figures (figs. 1–3). For a brief discussion of the tactile setæ of the chela, which are of considerable taxonomic importance, see Chamberlin (1924 *a*).

Species are diagnosed as briefly as seems consonant with adequacy. The revised classification here presented permits a rational brevity of description previously impossible in this order. Most of these species, particularly new ones, will be treated more fully and with complete illustrations in a number of impending faunistic and monographic studies.

All species which are, or have been, available for personal first-hand study to date are herein recorded. The "JC." numbers employed throughout in recording material refer to my private files, wherein are noted all observations and data of every sort, published and unpublished, including the ultimate disposition of the individual specimen. Species known only from the literature are, in general, included only where such inclusion is justified by reason of systematic completeness so far as genera and higher groups are concerned.

Relative to what may appear to some to be a tendency toward inordinate "splitting," I will merely mention the fact that this order has been relatively little studied in an integral way. This coupled with [illegible] even such skilled workers as Carl With, and made a genuinely scientific classification extremely difficult. Secondly, I have had, without much question, a far more representative collection of these animals available for critical study than has any past worker. And, finally, even the most extensive present collections of false scorpions are so fragmentary (in a cosmopolitan sense) that it is unreasonable to expect, even under the most favourable conditions, natural genera already supplied with their full complement of species. Nearly all the generic and higher

Fig. 1.


Y-apodeme
A
Coxal spines
Monosetose intercoxal tubercle
Tracheal trunk
B
C
D
Spinneret
es
is
ES
SB
IB
E
F
Coxa III
Coxa IV
FF
Coxa III
Unusually expanded bisetose intercoxal tubercle – indicative of sternal origin
Coxa IV
H
G
I

A. Chthoniid male genitalia. Internal sclerotic parts only (internal setæ omitted on left). (*Chthonius tetrachelatus*, 77.01002.)

B. Right coxæ; female epyginal area and tracheal trunks of a dithine chthoniid. (*Ditha philippinensis*, 284.01003.)

C. Portion of verrucadithine carapace showing eyes and granulation. (*Verrucaditha spinosus*, 74.01001.)

D. Left half of carapace and tergites showing typical chthoniine chætotaxy. The carapacal chætotaxal formula of the specimen is 4—4, 18. The tergal chætotaxal formula 4 : 4 : 4 : 4 : 6 : 6. (*Neochthonius paludis*, 43.06001.)

E. Chelicera showing typical form, chætotaxy, and spinneret (serrulæ omitted). (*Chthonius tetrachelatus*, 298.01004.)

F. Bi-setose intercoxal tubercle. Compare with fig. B. (*Chthonius tetrachelatus.*)

FF. Extreme development of intercoxal tubercle. (Chthoniine, sp. indet.)

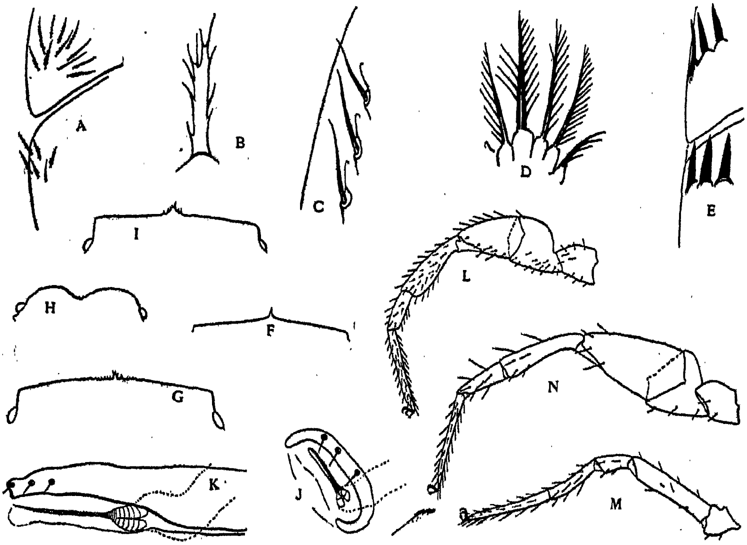
G. Non-pinnate flagellum of *Lechytia pacifica*. (68.01001.)

H. Pinnate flagellum of usual chthoniine type. (*Ditha cubana*, 73.01001.)

I. Tracheal trunks of a Homosphyronid false scorpion. Contrast with "B." (*Garypinus*, sp. indet.)

categories here defined will unquestionably receive large future accretions. There are some six or seven hundred specific names in the literature of the Chelonethida. These

Fig. 2.



A, B, C, D, E. Coxal species of various types. (*Chthonius ischnocheles*, 60.01001; *Mundochthonius magnus*, 63.01001; *Apochthonius mœstus*, 51.02001; *Tyrannochthonius johnstoni*, type; and *Ditha cubana*, 73.01001, respectively. See also fig. 1 B.)

F, G, H, I. Modifications of anterior median margin of the carapace. Taxonomically the epistomal process (or region). *Tyrannochthonius johnstoni*, type; *Chthonius ischnocheles*, New York specimen; *Verrucaditha spinosus*, 76.01001; and *Neochthonius paludis*, type.)

J. Oblique guard sclerite and stigmatic helix of a dithine chthoniid. (*Ditha cubana*, 73.01001.)

K. Undifferentiated "guard sclerite" and stigmatic helix of a chthoniine. (*Chthonius ischnocheles*, 513.01010.)

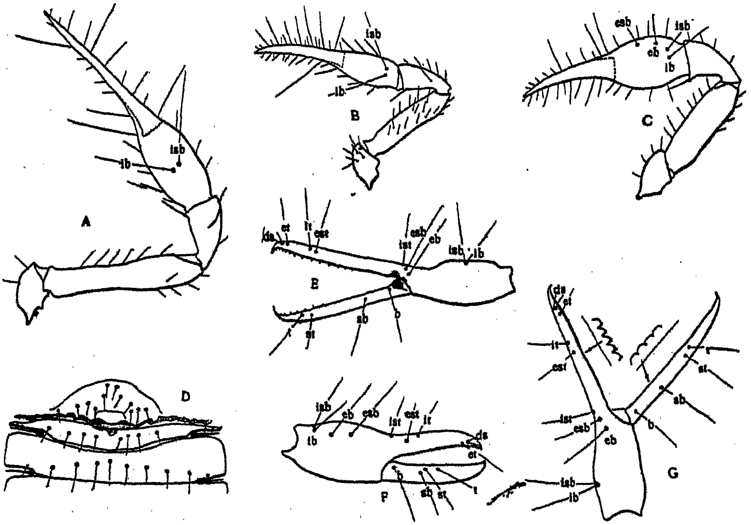
L. Leg iv. of a dithine chthoniid showing shortened patella. Compare with "N". (*Ditha cubana*, 73.01001.)

M and N. Legs i. and iv. respectively of a Heterosphyronid. Sequence of segments shown: trochanter, femur, patella, tibia, metatarsus (lacking in leg i., fig. M), and tarsus. (*Chthonius ischnocheles*, 513.01010.)

represent certainly less than a tenth of all the *real* species of the globe.

It may be noted, in passing, that very few of the heretofore described species can be safely placed in this classification on the basis of the literature alone, owing to the regrettable fact that most of them are inadequately described, so far as characters of real generic and higher value are concerned. The need is clear and imperative.

Fig. 3.



A. Pedipalpus (palpus) of chthoniine showing tactile setæ on dorsum of hand. (*Chthonius ischnocheles*, 513.01010.)
B. Dithine palpus. Note basal migration of tactile setæ. (*Ditha cubana*, 73.01001.)
C. Lechytiine palpus. Note the four tactile setæ on dorsum of hand. (*Lechytia pacifica*, 68.01001.)
D. Epyginal area of typical chthoniine. Compare with that of dithine (fig. 1 B). (*Chthonius ischnocheles*, 513.01010.)
E. Lateral aspect of left chela of *Chthonius tetrachelatus* (298.01003) showing dorsal depression anterior to tactile setæ *ib* and *isb*. Example of spaced marginal teeth.
F. Lateral aspect of right chela of *Lechytia pacifica* (68.01001) showing chætotaxy and dentition. Compare with E and G.
G. Lateral aspect of left chela of *Apochthonius mœstus* (295.01001) showing chætotaxy and contiguous type of dentition.

The practical utilization of this synopsis has, in large part, been checked and re-checked during the past few years, and I believe it to be usable as well as accurate. In the interest of greatest usefulness, I have employed analytical keys in place of formal descriptions wherever efficiency (which is to say, ease of operation) seems likely to be subserved.

I am greatly indebted to many individuals and institutions for the gift, exchange, and loan of material and literature, without which this contribution could not likely have been made.

In an institutional way, I am particularly indebted to the British Museum of Natural History, from which, through the intermediation of Dr. Stanley Hirst, a most valuable international collection of material was secured for determination. I am likewise greatly obligated to the Universitets Zoologiske Museum of Copenhagen for the liberal loan of much material, including valuable types. Dr. Kai L. Henriksen has acted as a most courteous agent in these transactions.

So far as individuals are concerned, I should like to record the fact that nowhere have I found a more generous and helpful spirit than has characterised all those persons to whom I have petitioned for help, either in the way of material for study or assistance in the extensive and extremely scattered literature of this order. To my colleagues in the study of the false scorpions, Dr. C. With of Copenhagen (recently deceased); Dr. Edvard Ellingsen of Norway; Dr. Albert Tullgren of Sweden; Dr. E. Simon (recently deceased) through the agency of M. Louis Fage of Paris; Mr. Wallis Kew of London, and the Rev. Robert Godfrey of South Africa, I am particularly grateful for their generosity in supplying me with reprints of their published works.

For contributions of material, either by loan or gift, I am especially indebted to the following:—Dr. Kai L. Henriksen of Copenhagen; Dr. Stanley S. Hirst, recently of the British Museum; Dr. Albert Tullgren of Sweden; Mr. John Hewitt of South Africa; Mr. W. W. Smith of New Zealand; Mr. Robert E. R. Grimmet also of New Zealand; Dr. C. F. Baker of the Philippine College of Agriculture (recently deceased); Dr. E. Mjöberg, recently of the Sarawak Museum in Borneo; Dr. F. Gravely of Madras; Mr. E. P. Van Duzee of the California Academy of Sciences; Dr. H. E. Ewing of the United States National Museum; Dr. C. R. Crosby of Cornell University; Dr. R. V. Chamberlin of the University of Utah (recently of the Museum of Comparative Zoology in Cambridge, Massachusetts); Dr. W. A. Hilton of Pomona College; Prof. E. O. Essig of the University of California; Dr. Frank Blaisdell of San Francisco; Mr. Brighton Cain of Oakland; Mr. Carl D. Duncan of San

José Teachers' College; Mr. F. Spruyt of Bennekom, Holland; and last, but not least, Prof. G. F. Ferris of Stanford University. I am greatly indebted to Dr. T. D. A. Cockerell for scanning the manuscript and making valuable suggestions. Other acknowledgments are made in the text as occasion arises.

2. SYSTEMATICS.

Order CHELONETHIDA, Thorell.

1883. *Chelonethi*, T. Thorell, p. 36.
1817. "*Faux Scorpiones*," P. Latreille, ii. p. 108.
1879. *Pseudoscorpiones*, E. Simon, vii. pp. 1–78.
1906. *Chelonethi*, C. With, iii. pp. 1–214.
1913. *Pseudoscorpionida*, J. H. Comstock, pp. 39–53.

Remarks. I am employing Thorell's distinctive and descriptive name for this order in place of the, perhaps, more frequent term, Pseudoscorpiones, ascribed to Latreille. In this I follow With.

The three suborders which I here recognize cannot be correlated to any recognizable extent with the two artificial and untenable suborders established by Balzan (1891). His names are consequently ignored.

Analytical Key to the Suborders of the Chelonethida.

1. Heterotarsate (fig. 2 M, N) (*i. e.*, legs i. and ii. with a single-segmented tarsus and iii. and iv. with a two-segmented tarsus); tracheal trunks often elongate (in certain cases extending as far forward as the maxillæ) and branching (fig. 1 B)—*not* ending in a nodal enlargement from which all tracheoles more or less simultaneously arise	[suborder nov., p. 57. HETEROSPHYRONIDA,
Homotarsate (*i. e.*, the tarsi of all legs similarly segmented); tracheal trunks short and terminating in a single nodal enlargement from which all tracheoles simultaneously arise — tracheal trunks not otherwise branched (fig. 1 I). (Group HOMOSPHYRONIDA.)	2.
2. Metatarsus distinctly present (i. e., *all* legs with a two-segmented tarsus)............	[suborder nov., p. 78 DIPLOSPHYRONIDA,
Metatarsus absent (i. e., *all* legs with a single-segmented tarsus)....................	[suborder nov., p. 78. MONOSPHYRONIDA,

Group HETEROSPHYRONIDA.

Suborder HETEROSPHYRONIDA, nov.

Type. Family Chthoniidæ, Hansen.

Historical Identity. Identical with the family Chthoniidæ as previously, and here, recognized. Corresponds to the Hemictenodactyli of Balzan (1891) in part. Balzan, however, included in his suborder the Obisiidæ as well, a disposition impossible to accept in light of present knowledge.

Distribution. Cosmopolitan.

Diagnosis. As defined in key. Members of this suborder are apparently primitively lacking in the possession of the venom apparatus (see Chamberlin, 1924 (*b*)) so characteristic of most other false scorpions.

Family **Chthoniidæ**, Hansen.

1894. Hansen, p. 232.
1906. With, pp. 64–68.
1925. Chamberlin, p. 334.

Type. Genus *Chthonius*, C. Koch.

Diagnosis. As for the order.

Subgroups. Includes three subfamilies and six tribes which are diagnosed in the following key:—

Analytical Key to the Subfamilies and Tribes of the Chthoniidæ.

1. Spinneret a series of three unbranched, elongate, acute, translucent processes or galeæ [Hansen, p. 77. TRIDENCHTHONIINÆ,

Spinneret non-galeate, consisting at most of a single heavily sclerotized (*vide* Ferris and Chamberlin, 1928), opaque, knob (fig. 1 E) .... 2.

2. Spiracles obliquely oriented; stigmatic helix surrounded anteriorly and laterally by a differentiated and prominent, recurved guard-sclerite (figs. 1 B, 2 J); epyginal area of female characteristically sclerotized (of type shown in fig. 1 B). (DITHINÆ, subfam. nov., p. 58) .... 3.

Spiracles transverse; stigmatic helix guarded anteriorly by a straight transverse modification of the posterior-lateral corner of the preceding sternite, separate guard-sclerite not differentiated (fig. 2 K); epyginal area of female non-sclerotic (fig. 3 D). (CHTHONIINÆ, Daday, p. 62) .... 4.

3. Fixed finger of chela with marginal teeth

well-spaced (as in fig. 3 E); dental margin of movable finger crenate in profile due to contiguous rounded teeth; carapace granulate with four prominent eyes (fig. 1 C); carapace anteriorly strongly emarginate and without median spinous prolongation (fig. 2 H); intercoxal tubercle absent .... VERRUCADITHINI, [tribe nov., p. 59.

Marginal teeth of chela close-set and contiguous—margin of finger serrate in profile (fig. 3 G); carapace and tergites smooth or maculate, not granulate or roughened; anterior margin of carapace with small median spinous elongation, which may or may not be set in a slight emargination; monosetose intercoxal tubercle present (fig. 1 B) .... DITHINI, tribe nov., [p. 60.

4. Dorsum of hand of chela with a single transverse pair of subadjacent tactile setæ (*ib* and *isb*, median transverse migrants) (fig. 3 A); flagellum of pinnate plumose blades (fig. 1 H).............. 5.

Dorsum of hand of chela with a group of four tactile setæ (*eb* and *esb*, longitudinal posterior migrants; *ib* and *isb*, transverse basal migrants) (fig. 3 C, F); flagellum a series of simple acuminate blades (fig. 1 G) .... LECHYTINI, tribe nov., [p. 76.

5. Marginal teeth of fingers of chela close-set and contiguous—the dental margin serrate or crenate in profile (rarely the teeth are serridentate) (fig. 3 G) .... KEWOCHTHONINI, [tribe nov., p. 63.

Marginal teeth of fingers of chela clearly spaced and non-contiguous anteriorly on fixed finger at least (fig. 3 E); teeth rarely absent on movable finger, but if present they are likewise anteriorly spaced as on fixed finger.............. CHTHONINI, tribe typ., [p. 68.

Subfamily *DITHINÆ*, nov.

Type. Genus *Ditha*, nov.

Diagnosis. In addition to the characters given in the key, it may be noted that the patella of leg iv. is distinctly longer in proportion to the femur than is the case in the Chthoniinæ proper (compare fig. 2 L with fig. 2 N). All known members of this subfamily possess coxal spines of a single simple type (fig. 2 E) on coxæ i. and ii. This uniformity is in remarkable contrast to the great variation in these same structures found in the true Chthoniinæ (fig. 2 A to D).

Distribution. Nearctic; Neotropical and Oriental species are known. It is probably tropicopolitan.

Tribe VERRUCADITHINI, nov.

Type. Genus *Verrucaditha*, nov.

Diagnosis. As given in key. Tergal chætotaxy well developed; all tergites except the first possess two transverse rows of setæ each. The granulation found in this group is unique in the Heterotarsata. Diagnosis based upon a single genus.

Distribution. Eastern United States (Indiana, Ohio, and Florida) and Brazil. The latter record is on the basis of the doubtful genus *Heterolophus*, Tömösváry, which is almost certainly a member of this tribe, and may, indeed, be synonymous with *Verrucaditha*. This cannot be established in absence of material.

Genus VERRUCADITHA, nom. nov.

1925. *Alura*, J. C. Chamberlin, p. 337. (Name preoccupied by Möschler in 1884 for a genus of Noctuids.)

Orthotype. *Chthonius spinosus*, Banks.

Diagnosis. Same as for tribe. Known from two species; both from Eastern United States.

Verrucaditha spinosa (Banks).

1893. *Chthonius spinosus*, Banks, p. 67.
1925. *Alura spinosus* (Banks), J. Chamberlin, p. 337.

Types. In collections of Museum of Comparative Zoology at Cambridge, Mass.

Material. I have examined two of Banks's co-types (♂ and ♀, JC. 76.01001–2), as well as a single ♀ (JC. 75.01001) accidental in a collection of another species from Lake Poinsette, Florida.

Diagnosis. Carapace bearing from 80–90 setæ; carapacal and tergal tubercles prominent; fixed finger of chela with the anterior thirteen teeth spaced more than their own basal width apart, preceded basally by ten sub-contiguous teeth less than their own basal width apart—23 to 24 marginal teeth in all; movable finger with 33 to 34 small rounded teeth which appear as crenations in profile view; posterior margin of carapace with eight border setæ; tergal chætotaxy: $10 : \frac{4}{14} : \frac{6}{12} : \frac{6}{17} : \frac{6}{17} : \frac{10}{13}$. Length, ♀, 1·6 mm.

Verrucaditha megaloptera, sp. n.

Holotype, ♀ (JC. 286.01001), from wet oak log, Bloomington, Indiana, Sept. 25, 1927, Coll. Henry G. Nester.

Paratypes. All collected by H. G. Nester, Bloomington, Indiana—1, sex unknown (JC. 289.01001)*, represented by fragments, from oak stump, 10.2.1927; 1, sex unknown (JC. 290.01001)*, from wet oak log, 10.2.27; 2, sexes unknown (JC. 292.01001* and 2), from damp oak log, 10.20.1927; 1, sex unknown (JC. 287.01001), from beech stump, 5.8.27. Winona Lake, Indiana—3, sexes unknown (JC. 288.01001*, 2*, 3), from damp oak log, 6.25.1927. Specimens marked * in Nester collection.

Other material. 1 ♀ (JC. 74.01001), from Cambridge, Ohio, collected by I. D. Taylor.

Diagnosis. Carapace bearing 100 to 112 setæ; fixed finger of chela with 12–13 distal spaced teeth preceded basally by 15 subcontiguous teeth which are less than their own basal width apart, 27–28 marginal teeth in all; movable finger with 26–27 rounded contiguous teeth; posterior margin of carapace with 10 broader setæ; tergal chætotaxy: $18 : \frac{6}{18} : \frac{8}{18} : \frac{12}{18} : \frac{12}{18} : \frac{13}{18}$. Length, ♀, 1·5 mm.

Related very closely to *spinosus.*

Doubtful Genera.

Genus Heterolophus, Tömösváry.

1884. Ö. Tömösváry, pp. 24–25.

Remarks. This genus is certainly valid and close to or identical with *Verrucaditha.* In the absence of material this cannot be settled. The carapacal emargination and prominent eyes characteristic of the tribe are shown in Tömösváry's figures. Brazilian.

Genus Megathis, Stecker.

1875. A. Stecker, p. 305.

Remarks. This genus, if valid, strongly suggests this tribe, but nothing definite can be said until, and if, Stecker's species are re-collected. It is from India.

Tribe DITHINI, nov.

Type. Genus *Ditha*, nov.

Diagnosis. Characters are given in key. The Dithini do not seem to possess in any marked degree the curiously rugose sclerotic parts characteristic of the Verrucadithini.

Distribution. Two genera are known—one Malayan, the other Malayan and West Indian.

Genus Ditha, nov.

Orthotype. *Ditha elegans*, sp. n.

Diagnosis. Tergites each with two well-defined transverse rows of setæ; carapace with 70–100 or more setæ; chela with tactile setæ *st* and *t* two or three areolar diameters apart; four eyes, posterior pair tending towards loss (as in fig. 1 D).

Distribution. Three closely related species are known—two from Malaya and one from the West Indies.

Ditha elegans, sp. n.

Holotype, ♂ (JC. 259.02001). *Allotype*, ♀ (JC. 251.02002). Coll. by Th. Mortensen; Banda, Dutch East Indies. Mortensen Collection. Paratype, ♀ (JC. 259.02003). In type-collection.

Diagnosis. Similar to *philippinensis*, from which it differs in the palpal proportions. Chela distinctly much less than five times as long as broad (4·5); hand distinctly less than twice as long as greatest breadth; tibiæ 2·2 times as long as greatest breadth.

The spinous prolongation of the carapace in the holotype (♂) differs completely from that found in *philippinensis*. In the latter it is a parallel-sided, irregularly blunt process; in *elegans* it is top-shaped, with the apex proximal. The carapacal process in the female is identical in both species. Length, ♂ 1·9 mm., ♀ 2·1 mm.

Ditha philippinensis, sp. n.

Holotype, ♂ (JC. 284.01001). *Allotype*, ♀ (JC. 284.01002). Paratype, ♀ (JC. 284.01003), in United States National Museum. C. F. Baker Collection. From Mount Makiling, Luzon, Philippine Islands.

Diagnosis. Anterior median margin of carapace slightly excavated and bearing in its centre a blunt spinous prolongation, which is at least as long as broad; coxal spines number 5 or 6 per coxa; chela about 5 times as long as broad (5·0–5·2); hand less than twice as long as broad. Length, ♂ 1·8 mm., ♀ 2·0 mm.

Remarks. With *elegans*, *philippinensis* differs from *cubana* in the coxal spines and character of the anterior margin of the carapace. From *elegans* it differs primarily in proportions.

Ditha cubana, sp. n.

Holotype, ♀ (JC. 73.01001). Collected by C. F. Baker at Cayamas, Cuba. This specimen has been erroneously listed in the literature by Banks[†] as *Chthonius longipalpus*, Banks. Exchange.

Additional Material. 2 ♂ (JC. 300.01001–2) and 4 ♀ (JC. 300.01003–6). Port Antonio, Jamaica. Coll. Dr. E. W. Berger. (These specimens unfortunately ruined for analysis through an accident in preparation.)

Diagnosis. Similar to *elegans* and *philippinensis* in most respects; differs in the character of the carapacal emargination, which is medianly serrate but not produced; with three instead of six coxal spines per coxa; the femur of the palpus is 4·2–4·3 times as long as broad; tibia 2·1 times as long as broad; chela 5 times as long as broad. A smaller species than either of the preceding forms: ♀, 1·6 mm. long.

Genus Compsaditha, nov.

Orthotype. *Compsaditha pygmæa*, sp. n.

Diagnosis. Tergites each with a single row of about ten marginal setæ; carapacal chætotaxy reduced, consisting of about forty symmetrically disposed setæ; *t* and *st* of movable finger of chela subcontiguous—about one areolar diameter apart; eyes as in *Ditha*.

Distribution. The orthotype and only known species is from the Philippine Islands.

Compsaditha pygmæa, sp. n.

Holotype, ♀ (JC. 550.05001). Paratypes, 3 ♀ (JC. 550.05002–4). Coll. C. F. Baker, Mount Makiling, Luzon, Philippine Islands. Specimens 3 and 4 in collections of United States National Museum.

Diagnosis. Coxal spines 4–5 distally incised blades of same general form typical of *Ditha*; femur of palpus 3·55 times as long as broad; tibia 1·65 times as long as broad; chela 3·52 times as long as broad; movable finger 0·65 total length of chela. Pigmy species: ♀, 1·1 mm. long.

Subfamily *Chthoniinæ*, Daday.

1887. E. Daday, p. 167.
1906. C. With, p. 68.
1925. J. C. Chamberlin, p. 334.

Type. Genus *Chthonius*, C. Koch.

Diagnosis. As given in key. See also under diagnosis of the Dithinæ, where certain additional characters are contrasted. It includes three well-marked tribal groups.

[†] "Arachnida of Cuba," Cent. Exp. Sta. Rep. of Cuba, (2) p. 174.

Distribution. Cosmopolitan.

Tribe KEWOCHTHONINI, nov.

Type. Genus *Kewochthonius*, nov.

Diagnosis. Characters as given in key.

Distribution. Almost cosmopolitan. Probably, predominantly tropical and subtropical.

Included Genera. Seven genera are here tentatively discriminated. Their diagnoses follow:—

Analytical Key to the Genera of the Kewochthonini.

1. Marginal teeth of chela subequally developed—the dental margin of the fingers in profile, an evenly serrate or crenate appearance (fig. 3 G); marginal teeth of chela without subsidiary dentations; inner margin of chela from a dorsal aspect without a mono-setose wart-like projection—evenly rounded	2.
Marginal teeth of fingers of chela basally contiguous, but otherwise not as above; dental margin of fingers in profile serridentate due to an anterior and posterior subsidiary dentation on each of anteriormost teeth at least; individual marginal teeth superficially similar in form to those of the shark; inner margin of chela as seen from a dorsal aspect with a mono-setose wart-like tubercle near tip of hand.	*Selachochthonius*, gen. nov., p. 68.
2. Coxal spines clearly present and well developed on one or more of the pedal coxæ (fig. 2 A–E); tergal border setæ number between 6 and 8 as a rule (fig. 1 D); (intercoxal tubercle present or absent) ..	3.
Coxal spines vestigial or absent; tergal border setæ 14–16; intercoxal tubercle absent..	*Maorichthonius*, J. C. Chamb., p. 64.
3. Bi-setose intercoxal tubercle present (fig. 1 F).....................................	4.
Intercoxal tubercle absent	5.
4. Coxal spines present on pedal coxæ ii. only; teeth distinctly developed on both fixed and movable finger of chela; anterior projection or apex of coxa i. non-setose..	*Mundochthonius*, gen. nov., p. 64.
Coxal spines present on pedal coxæ ii. and iii.; marginal teeth of movable finger of chela much reduced in comparison with fixed finger; one or two minute setæ at or very near tip of apex of coxa i.	*Neochthonius*, gen. nov., p. 66.
5. Coxal spines present on pedal coxæ ii. and iii., consisting of "bristle-like" patches .	*Kewochthonius*, gen. nov., p. 65.

Coxal spines present on either i. or ii., but never iii. (or rather ii. and iii., as above). 6.
6. Coxal spines present on coxæ i. only, consisting of three (or thereabouts) acute seta-like blades which arise from a peculiar obliquely sclerotized slit, which latter simulates an outwardly deflected basal spur of the blade itself (fig. 2 C); with 22 or more carapacal setæ; chelicera with seven setæ on palm .... *Apochthonius*, gen. nov., p. 66.
Coxal spines on coxa ii. only, consisting of a row of three or four equally pinnate blades; carapace with 18 setæ; chelicera with five on palm..................... *Austrochthonius*, gen. nov., p. 68.

Genus MAORICHTHONIUS, J. C. Chamberlin.

1925. J. C. Chamberlin, p. 335.

Orthotype. *Maorichthonius mortenseni*, J. C. Chamberlin.

Diagnosis. Characterized in key and above reference. With five setæ on palm of chelicera; spinneret absent.

Known only from the type-species, which is from New Zealand.

Genus MUNDOCHTHONIUS, nov.

Orthotype. *Mundochthonius erosidens*, sp. n.

Diagnosis. Characters as given in key. Six setæ on palm of chelicera; spinneret present as a sclerotic knob.

Distribution. Representatives of three species are apparently present in my material. All from the continental limits of the United States.

Mundochthonius erosidens, sp. n.

Holotype, ♂ (JC. 58.01001); collected by the author, under stone on damp serpentine outcrop, Jasper Ridge, San Mateo County, California, January 1, 1923.

Diagnosis. Tergal chætotaxy 4 : 6 : 6 : 6 : 6 : 6 : 6 : 6. Sternites vi.–ix. each with eight marginal setæ; coxal spine short, a single flattened blade about twice as long as basally broad and with eight or nine fine but deep terminal incisions —"frayed"; eyes totally absent or vestigial; sternites v.–viii. each with a lateral, more or less egg-shaped, sclerotization on either side, the pointed end of the oval being directed mesally; the sclerotization noted is in the form of a narrow band enclosing a light central area. The following proportions are from KOH-treated material:—Carapace 1·3 times length of chelicera; femur 3·7 times as long as width; chela 4 times as long as broad. Length, ♂, 1·1 mm. Very close to *montanus*, sp. n.

Mundochthonius montanus, sp. n.

Holotype, ♀ (JC. 81.01001). Collected by E. W. Goldsmith at Manitou, Colorado, in surface-soil at an elevation of 8500 feet.

Diagnosis. Tergal chætotaxy as in *erosidens*, except that tergite ii. has four instead of six marginal setæ; sternites vi.–ix. with 10–11 marginal setæ; coxal spine as in *erosidens*; the ventral sclerotic pattern noted for *erosidens* lacking. The following proportions are from KOH-treated material:—Carapace 1·2 times longer than chelicera; femur 4 times as long as broad; chela about 3·8 times as long as broad. Length, ♀, 1·1 mm.

Mundochthonius magnus, sp. n.

Holotype, ♀ (JC. 65.01001). San Mateo County, California. Cornell University Collection. Courtesy of Dr. C. R. Crosby.

Diagnosis. Similar to *montanus* and *erosidens*, from which it differs in the great development of the coxal spine, which is 5 times as long as its basal width and is characterized by marginal as well as distal incisions or dentations (fig. 2 B); tergal chætotaxy, 4 : 6 : 8 : 8 : 8 : 8 : 8; sternites vi.–ix. with 10–14 marginal setæ; lacking characteristic ventral sclerotic pattern described for *erosidens*. The following proportions are from KOH-treated material:—Carapace 1·3 to 1·4 times as long as chelicera; femur 3·6 times as long as broad; chela about 3·5 times as long as broad. Length, ♀, 1·5 mm.

Genus KEWOCHTHONIUS, nov.

Orthotype. *Chthonius halberti*, Kew.

Diagnosis. As given in key. Although not mentioned by Kew in his description of the type-species, it is possible that an intercoxal tubercle is present. If so *Kewochthonius* and *Neochthonius* must probably be fused and the latter name dropped. The type-species is from England and Ireland. Other representatives, no doubt, occur in Europe. See discussion under *Chthonius orthodactylus* (Leach).

Kewochthonius halberti (Kew).

1916. *Chthonius halberti*, Kew, pp. 76–77, fig. 3.

Remarks. This interesting species was taken originally beneath stones on the sea-shore between the levels of orange-lichens and Pelvetia, Malahide, Co. Dublin, Ireland. Later collected in England.

This species needs to have the presence or absence of the intercoxal tubercle noted, the tergal, carapacal, and cheliceral chætotaxy described, and the pattern of the tactile setæ of the chela recorded. As noted above, it may be congeneric with those species described under *Neochthonius*, gen. nov.

Genus NEOCHTHONIUS, nov.

Orthotype. *Neochthonius stanfordianus*, sp. n.

Diagnosis. With characters given in key. Coxal spines a row of nearly equally-pinnate blades on coxæ ii. and iii.; with five setæ on palm of chelicera; spinneret present as a sclerotic knob. Includes two species, both from the continential limits of the United States.

Neochthonius stanfordianus, sp. n.

Holotype, ♀ (JC. 59.01001). Collected by E. A. McGregor, April 30, 1922, under stone in bed of San Francisquito Creek, Jasper Ridge, San Mateo County, California.

Diagnosis. Posterior margin of carapace with two border setæ; no posterior pair of eye-spots; tergal chætotaxy, 4 : 4 : 4 : 4 : 6 : 6 : 6 : 6 : 6; sternites each with six border setæ; carapace with a total of sixteen setæ; marginal teeth of movable finger of palpus weakly developed, twenty-one of the distal teeth being well enough developed to count. Proportions from KOH-treated material:—Femur 4·45 times as long as broad; chela 4·7 times as long as broad. Length, ♀, 1·35 mm.

Neochthonius paludis, sp. n.

Holotype, ♂ (JC. 43.06001). Billy's Island, Okefinokee Swamp, Georgia. Cornell University Collection. Courtesy of Dr. C. R. Crosby.

Diagnosis. Tergal and sternal chætotaxy as in *stanfordianus*; posterior margin of carapace with five (normal number, no doubt, either four or six) marginal setæ; carapace with a total of eighteen or nineteen setæ; posterior pair of eye-spots present; marginal teeth of movable finger as in *stanfordianus*. Proportions from KOH-treated material:—Femur 4·35 times as long as broad; chela 4·9 times as long as broad. Length, ♂, 1·17 mm.

Genus APOCHTHONIUS, nov.

Orthotype. *Chthonius mœstus*, Banks.

Diagnosis. Characters as given in key. Spinneret absent.

Includes two species at present, one from the eastern United States, the other from the Pacific Coast of the United States.

Apochthonius mœstus (Banks).

1891. *Chthonius mœstus*, Banks, p. 165.

Types. Deposited in the United States National Museum or Museum of Comparative Zoology at Cambridge.

Material examined. New York State: ♂ (JC. 70.01001)*, Deneyter County, July 4, 1922, by C. R. Crosby; ♀ (JC. 71.01001)*, Enfield Glen, Tompkins County, Oct 20, 1920, by C. R. Crosby; ♂ (JC. 51.02001), Ithaca, Oct. 8, 1922, by C. R. Crosby. Washington, D.C. : 3 ♂ (JC. 295.01001–3), in old leaves, March 4, 1900, coll. H. Barber (295.01003 in collection of R. V. Chamberlin). Missouri : ♂, ♀, and ⊙ (JC. 33.02001*, 2*, and 3), Columbia, by C. R. Crosby. State unknown : ♂, labelled "pseudoscorpion from San Sabiera(?), nest" (JC. 297.01001). Collection of R. V. Chamberlin. Specimens marked with asterisk are property of Cornell University.

Diagnosis. Carapace with 22 or rarely 24 setæ; four eyes, of which the posterior pair are poorly developed; tergal chætotaxy, 4 : 4 : 6 : 7 : 8 : 8 : 8–10 : 9–10; sternal chætotaxy, 9 : 9 : 12–13 : 12–13; tarsus i. distinctly longer than tarsus iv.; femur 4·2 to 4·5 times as long as broad; tibia 1·7–1·8 times as long as broad; chela 4·5–4·7 times as long as broad; fingers 0·70 total length of chela; male genitalia with dorsal Y-shaped apodeme (see fig. 1 A) slightly but distinctly obtusely angled, its arms shorter than arms of ventral Y-shaped apodeme; arms of ventral Y-shaped apodeme not basally flaring. Length, ♂ (JC. 51.02001) 1·4 mm.; of ♂ (JC. 295.01001) 2·0 mm.; ♀ (JC. 69.01001) 1·6 mm.

Remarks. As will be observed from the diagnosis, this seems to be a somewhat variable species. It will require much more material than is available to me definitely to settle its status. The male genitalia furnish the best characters for separating it from its western cousin, *occidentalis*, sp. n.

Apochthonius occidentalis, sp. n.

Holotype, ♂ (JC. 44.02001). Collected in moss at Portland, Oregon, by Prof. E. C. Essig, March 28, 1921.

Diagnosis. Characters very similar to those of *mœstus*, on which account it is separable therefrom with considerable difficulty, except for the very different male genitalia.

Chætotaxy and carapacal features as in *mœstus*; tarsus i. very close to being equal in length to tarsus iv.; palpal proportions (from KOH-treated specimen): femur 4·35 times as long as broad; tibia 1·7 times as long as broad; chela 4·95 times as long as broad; fingers 0·68 total length of chela; dorsal Y-shaped apodeme elongate, its arms diverging at about a right angle from each other, and distinctly longer than arms of ventral, Y-shaped apodeme; each arm of ventral Y-shaped apodeme widely flaring at base, so that each has the form of a strongly curved, expanded bird-wing. Length, ♂, 1·3 mm.

Genus AUSTROCHTHONIUS, nov.

Orthotype. *Chthonius chilensis*, J. C. Chamberlin.

Diagnosis. Characters as given in key. Tergal chætotaxy, 4:4:6:6:6:6:6. Spinneret represented by a small sclerotic hump (fig. 1 E). Known only from the type-species, which is Chilean.

Austrochthonius chilensis (J. C. Chamberlin).

1923 (*b*). *Chthonius chilensis*, J. C. Chamberlin, p. 187.

Holotype. Collections of Cornell University. From Butalcura (Ciloe Island), Chile.

Remarks. For a complete description of this form, together with a key for separating it from other South American species, see Chamberlin (*t. c.*).

Genus SELACHOCHTHONIUS, nov.

Orthotype. *Chthonius serridentatus*, Ellingsen.

Diagnosis and Remarks. Characterised in key as adequately as Ellingsen's description permits. The chætotaxy and coxal spines, in particular, need elucidation. Includes at present only the type-species.

Selachochthonius serridentatus (Ellingsen).

1912. *Chthonius serridentatus*, Ellingsen, p. 123.

Remarks. Adequately characterised, specifically, by Ellingsen.

Tribe CHTHONINI, typicus.

Type. Genus *Chthonius*, C. Koch.

Diagnosis. Characters as given in key.

Distribution. Probably cosmopolitan.

Genera. Three genera are here recognized. They are diagnosed in the following key :—

Analytical Key to the Genera of the Chthonini.

1. Marginal teeth of fixed finger of chela consisting of large teeth alternating with small ones; marginal teeth of movable finger small and contiguous (with two small eyes) .... *Pseudochthonius*, [Balzan, p. 69.

   Marginal teeth of fixed finger of chela not alternately large and small; teeth of movable finger, if developed at all, are, anteriorly at least, clearly spaced; (eyes two or four) .... 2.

2. Bi-setose intercoxal tubercle (fig. 1 F) present; coxal spines on pedal coxæ ii. and iii. (fig. 2 A) consisting of clusters of a larger or smaller number of bi-pectinate or pinnate seta-like blades .... *Chthonius*, C. Koch, [p. 69.

   Intercoxal tubercle absent; coxal spines present on pedal coxa ii. only, variously modified, but not as in *Chthonius* ...... *Tyrannochthonius*, [gen. nov., p. 74.

Genus Pseudochthonius, Balzan.

1891. L. Balzan, p. 546.
1906. C. With, pp. 66–68, 69.
1925. J. C. Chamberlin, p. 338.

Genotype. *Pseudochthonius simoni*, Balzan.

Remarks. As diagnosed in the key. The spaced teeth of the fixed finger of Balzan's type-species will certainly place *Pseudochthonius* in the Chthonini. The alternate spacing of large and small teeth is found in neither other genera here recognized, and hence, awaiting further elucidation, Balzan's group is re-established. No doubt, other South American forms will be found to fall in with *simoni* to form a natural group, whatever the fate of *Pseudochthonius* as such.

Genus Chthonius, C. Koch.

1843. C. Koch, p. 76.
1879. E. Simon, p. 69.
1906. C. With, pp. 66–68, 69.
1911. H. W. Kew, p. 56.
1925. J. C. Chamberlin, p. 334.

Genotype. *Obisium orthodactylum*, Leach. Designated by E. Simon.

Diagnosis. Restricted as indicated in key. I recognize at present seven or eight Holarctic species unquestionably belonging to this genus. Such as are available to me are diagnosed in the following key.

The marginal teeth of the fingers of the chela are typically very minute, but clearly spaced, anteriorly; proceeding posteriorly these become larger and strongly acute, still further caudad toward the base of the fingers they again decrease in size and tend to become contiguous.

Analytical Key to certain Members of the Genus Chthonius.

1. Dorsum of hand of chela sharply depressed anterior to the tactile setæ of the hand (fig. 3 E); base of mobile finger of chela with a prominent internal apodeme (fig. 3 E); the strongly acute and *prominent* marginal teeth of fixed finger about twice as numerous as those of the movable finger (fig. 3 E)	2.
Dorsum of chela with an evenly and gently rounded contour, not depressed as above (as in fig. 3 G); mobile finger without an unduly prominent internal apodeme; marginal teeth of chela not as above (either more or less numerous relative to each other)	4.
2. Posterior margin of carapace with but two large submedian setæ; chela not markedly pedicellate, as in *virginicus*	3.
Posterior margin of carapace with two large submedian setæ as above and in addition with two much smaller lateral setæ—four in all; chela distinctly and suddenly swollen beyond pedicel, so that the differentiation between pedicel and hand is much clearer than usual	*virginicus*, sp. n.
3. Fixed finger of chela with about twelve *prominent* and well-spaced distal teeth, these preceded basally by about the same number of small, rounded, and clearly contiguous teeth; movable finger with six prominent anterior teeth preceded basally by 15–18 small rounded and contiguous ones; each row of guard-setæ (fig. 1 A) of male genitalia longitudinally divided into two groups of two setæ each by a median hiatus	*californicus*, sp. n.
Marginal teeth of chela not as above—never with proximal teeth well developed and contiguous; guard-setæ of male genitalia not spaced as in *californicus*, but as figured (fig. 1 A)	*tetrachelatus*(Preyssler).
4. Carapace with four large marginal setæ; movable finger of chela with many prominent spaced marginal teeth—dentition nearly as well developed as on the fixed finger	*ischnocheles* (Hermann).
Carapace with two large submedian and	

two small lateral marginal setæ; movable finger of chela with marginal teeth very weakly developed or even vestigial—"toothless" in comparison with fixed finger .... *orthodactylus* (Leach).

Chthonius orthodactylus (Leach).

1817. *Obisium orthodactylum*, Leach, p. 51.
1832. *Obisium ischnocheles*, De Théis (not Hermann) (misdetermination), pp. 65–66.
1892. *Chthonius orthodactylus* (Leach), Cambridge, p. 209, fig.
1911. *Chthonius orthodactylus* (Leach), Kew, p. 57, fig. 20.

Type. British Museum of Natural History. See Kew (*t. c.* p. 56, footnote 2) for a discussion of the matter of type-designation.

Material examined. 3 ♀ (JC. 63.01001–3), France. Exchange M. Simon's collection, courtesy M. L. Fage of Paris.

Remarks. This species is apparently widespread and common throughout Western Europe at least.

C. tenuis, L. Koch, is related to the foregoing species, and will run to it in the preceding key *on the basis of the two large submedian border-setæ of the carapace.* It may be separated therefrom by the darkened hand of the chela and the proximity of the anterior eyes to the front margin of the carapace (½ as compared with 1 diameter).

Ellingsen in 1909 (p. 211), in recording a species under the name *orthodactylus* from various parts of Italy, remarks: "It is very doubtful if this is Leach's species, but I am certain that it is that of L. Koch and E. Simon. It is characterised by the very dense row of small teeth on the inner margin of the fingers of the palps. . . ." Ellingsen, as Kew (1916, p. 77) has already pointed out, is quite right in doubting the identity of his and Leach's species. The species he records is no doubt a Kewochthonine, possibly *Kewochthonius.* In passing, I may remark that the material of *orthodactylus* received by me from M. Simon's collection was correctly labelled.

Chthonius ischnocheles (Hermann).

1804. *Chelifer ischnocheles*, Hermann, p. 118, figs.
1802–5. *Chelifer trombidioides*, Latreille, p. 142.
1869. *Chthonius pennsylvanicus*, Hagan, p. 52.
1873. *Chthonius rayi*, L. Koch, pp. 48–49.
1911. *Chthonius rayi*, L. Koch, Kew, p. 58, fig. 22.

Types. Neither Hermann's nor Latreille's types are probably extant. Their species are generally considered as not surely recognizable, and hence have been previously ignored (*cf.* Kew, *t. c.* p. 56, footnote 2). Investigation now discloses that *Chthonius pennsylvanicus*, Hagen, from the United States, is almost surely identical with *Chthonius rayi*, L. Koch, as generally recognized. This necessitates the suppression of the name *rayi* in favour of *pennsylvanicus*, Hagen, *unless* some still earlier available name can be found. Kew (1911, *t. c.*) considers both *trombidioides* and *ischnocheles* as probably representing the species under consideration. Since there is nothing in either Leach's or Latreille's descriptions to *prevent* them from being recognized as *rayi*, and since they will otherwise be listed indefinitely as unrecognizable, it seems expedient to recognize these names in preference to the wholly inappropriate *pennsylvanicus*. On this basis the synonymy stands as listed. Precedence is given to Hermann's name on the basis that a series of volumes issued over a period of time takes the date of issue of the last volume.

Material examined. England: 10 specimens, ♂ and ♀ (JC. 513.01001–10), Horsley, Surrey, England. Collections of British Museum of Natural History (specimens 8–10 inclusive in author's collection). Italy: 1 ♂ (JC. 60.01001), Genova. Exchange from British Museum: 2 ♂ and 1 ♀ (JC. 61.01001–3), Gennazano (exchange from Louis Fage). Madeira Islands: 1 ♀ (JC. 283.01001), collected by F. S. Hirst in 1920 (shows slight variations from typical English material) (British Museum Collections). United States of America: ♂ and ♀ (JC. 78.01001–2), collected by H. Hall in company with *C. tetrachelatus*, in rotting shingles, New Haven, Connecticut; 3 ♂ (JC. 62.01001–3), collected by Nathan Banks, Pokeepsie, New York. Collections of Museum of Comparative Zoology, except specimen 3, which is in the author's collection.

Remarks. This wide-ranging and well-known species is recorded from every major country of Europe (mostly under the name *rayi*) and, as *pennsylvanicus*, from much of our Atlantic seaboard. It is quite probable that careful study of extensive collections would permit recognition of subspecies.

Chthonius tetrachelatus (Preyssler).

1790. *Scorpio tetrachelatus*, Preyssler, p. lix.
1873. *Chthonius trombidioides* (Latr.), L. Koch (misdetermination, *teste* Kew, *t. c.*), pp. 49–50.
1879. *Chthonius tetrachelatus* (Preyssler), Simon, p. 70.
1891. *Chthonius longipalpus*, Banks, p. 164.
1911. *Chthonius tetrachelatus* (Preyssler), Kew, p. 58.

Types. Probably not extant. Determination on basis of common repute.

Material examined. France: 2 ♂ (JC. 63.02001–2), exchange from Louis Fage. Sweden: 2 ♀ (JC. 57.01001–2), Uppsala, exchange from Albert Tullgren. United States of America: Connecticut, 2 ♂ (JC. 77.01001–2), Rawson Park, collected by H. Hall; 1 ♂, 3 ♀ (JC. 78.01003–6), collected in company with *Chthonius ischnocheles* (JC. 78.01001–2), as previously recorded, in rotting shingles at New Haven, collected by H. Hall. New York: Sea Cliff, labelled as *Chthonius longipalpus*, Banks, ♂ and 2 ♀ (JC. 72.01001–3), "from sand bank on ground"—loan from Museum of Comparative Zoology; 2 ♂ and 1 ♀ (JC. 264.01001–3), exchange from M.C.Z.; males and females (JC. 298.01001–25), collected by R. V. Chamberlin (specimens 1–10 in author's collection). 3 ♂ and 1 ♀ (JC. 67.01001–4), collected by C. R. Crosby at Riverhead, Sound Beach (specimens 1 and 3 in Cornell University Collection). Indiana: Bloomington 1, sex unknown (JC. 294.01001), from wet log, and 3, sexes unknown (JC. 291.01001–3), from damp oak log, collected Oct. 3, 1927, by H. G. Nester (specimen 3 in Nester collection).

Remarks. As represented in my collection this species is quite variable in size and proportions, and it is quite likely that several closely related forms are included. More material is necessary before any reliable judgment on this point can, however, be made. In particular, my two French specimens seem so divergent in point of size that there is a strong temptation to recognize them as distinct. The probabilities are that several subspecies, at least, will be recognized.

Chthonius virginicus, sp. n.

Holotype, ♀ (JC. 64.01003); paratypes, 2 ♀ (JC. 64.01001–2). Collected by C. R. Crosby at Great Falls, Virginia, April 13, 1921. Paratype 1 in author's collection; holotype and paratype 2 in collection of Cornell University.

Other material. 1 ♀ (JC. 293.01001), from Bay Ridge, Maryland. Collected by R. V. Chamberlin. 1 ♀ (JC. 296.01001), from Washington, D.C. Collected by R. V. Chamberlin.

Diagnosis. Separable from *tetrachelatus*, to which it is closely related, by the carapacal chætotaxy and the more pedicellate chela. Palpal proportions: femur 5·3 times as long as broad; tibia 1·7 times as long as broad; chela 4·6 times as long as greatest breadth; fingers 0·53 total length of chela. Length, ♀, 1·7 mm.

Chthonius californicus, sp. n.

Holotype, ♂ (JC. 66.01001); *allotype*, ♀ (JC. 66.01002). Collected January 1920 at Berkeley, California, by C. R. Crosby. Cornell University Collection.

Diagnosis. *Chthonius*, related to *tetrachelatus* and *virginicus* by the dorsal depression of the hand of the chela and other characters, but differing markedly therefrom in the male genitalia and dentition of the fingers of the chela as indicated in key. The following proportions are from KOH-treated material:—Femur of palpus 5 times as long as broad; tibia 1·85 times as long as broad; chela 4 times as long as greatest breadth; fingers 0·58 total length of chela. Length, ♂ 1·4 mm., ♀ 1·6 mm.

Genus TYRANNOCHTHONIUS, nov.

Orthotype. *Chthonius terribilis*, C. With.

Diagnosis. As characterized in the key. A homogeneous and natural group of five known species, two of which are new and all of which are from lands impinging, more or less directly, upon the Pacific Ocean in its broader sense. It bears certain evident affinities with *Pseudochthonius*.

The five included species are diagnosed in the following key:—

Analytical Key to the Species of Tyrannochthonius.

1. Coxal spine a compound organ consisting of 4–5 doubly pinnate branches arising from a more or less common base (fig. 2 D); carapacal spine acute and non-serrate (fig. 2 F); with but two weakly developed eyes; both fingers of chela with teeth subequally developed and numbering between 20 and 25; carapace with a total of 14 setæ; from Mexico .... *johnstoni* (J. C. Chamberlin).

Coxal spine not as in *johnstoni*, consisting of a more or less even row of ligulate, distally-frayed, or incised blades; anterior margin of carapace not produced to a sharp point as in *johnstoni*; with four eyes .... 2.

2. Chela with about twenty marginal teeth on both fixed and movable fingers; from Koh-Chang (Siam) .... *terribilis* (With).

Chela with clearly fewer teeth on movable than on fixed finger—number of marginal teeth of fixed finger either greater or less than 20 .... 3.

3. Tergites all with but a single lateral seta (chætotaxy 2 : 2 : 2, etc.); movable finger

with eight large teeth; fixed finger with 15–16 teeth; from Sumatra .... *johni* (Redikorzev).

Tergites with at least four marginal setæ each; dentition of chela not as in *johni* (when *both* fingers are considered) ...... 4.

4. Fixed finger of chela with eleven teeth; movable finger with eight teeth; carapace with a total of sixteen setæ; tergal chætotaxy, 4 : 4 : 4 : 4 : 4 : 6 : 6; small species (♂ 1·1 mm. long), from Philippine Islands. *bakeri*, sp. n.

Fixed finger of chela with 33–35 marginal teeth; movable finger with 16–17 teeth; carapace with a total of eighteen setæ; tergal chætotaxy as in *bakeri*, except that V has six instead of four setæ; larger species (2·1–2·2 mm. long), from New Zealand .... *grimmeti*, sp. n.

Tyrannochthonius johnstoni (J. C. Chamberlin).

1923 (*a*). *Chthonius johnstoni*, J. C. Chamberlin, p. 337, figs.

Holotype. Holotype and only known specimen deposited in the collections of the Californian Academy of Sciences. From Puerto Escondido, Lower California, Mexico.

Remarks. As indicated by diagnosis in key preceding, this species differs considerably from the other members of the genus in the coxal spine, eyes, and carapacal chætotaxy. It might best be considered subgenerically distinct.

Tyrannochthonius terribilis (C. With).

1906. *Chthonius terribilis*, With, p. 69, figs.

Types. Probably in the Universitets Zoologiske Museum at Kjöbnhavn. From Koh Chang and Lem Ngob off the coast of Siam.

Remarks. This species is ably described by With (*t. c.*). More information is needed relative to its chætotaxy. It is close to *bakeri*, sp. n., and *johni* (Redikorzev).

Tyrannochthonius johni (Redikorzev).

1922. *Chthonius johni*, Redikorzev, p. 550.

Type. Probably in Zoological Museum at Leningrad.

Remarks. Redikorzev is to be congratulated on having so excellently described this species that its generic placing and specific identity are beyond question.

Tyrannochthonius bakeri, sp. n.

Holotype, ♂ (550.18001), C. R. Baker collection, Mount

Makiling, Luzon, Philippine Islands. This species is respectfully dedicated to a great zoologist, Dean C. F. Baker.

Diagnosis. Characters as indicated in key. Carapacal spine is short and inconspicuous. The great reduction in the number of marginal teeth of the chela is one of the most distinctive features. Femur of palpus 5·3 times as long as broad; tibia 2·1 times as long as broad; chela 6·3 times as long as broad; fingers 1·2 times longer than hand. Tergal chætotaxy, 4 : 4 : 4 : 4 : 4 : 6 : 6 : 6. Near the tip and on the outer curve of the fixed finger is a small slender protuberance, presumably sensory in function, which recalls a structure described for the type of *Pseudochthonius* by Balzan (1891, p. 546). Neither With nor Redikorzev describe a similar structure for their species, and it seems to be absent in *grimmeti* and *johnstoni* as well. There is no question as to the generic affinities of this species.

Tyrannochthonius grimmeti, sp. n.

Holotype, ♂ (JC. 94.01001), collected by Dr. Robert E. R. Grimmet, Day's Bay, Wellington Harbour, New Zealand. Under log in Beech Forest, Nov. 20, 1920. I take pleasure in dedicating this fine species to its discoverer.

Diagnosis. Characters as given in preceding key. Carapacal spine as in *bakeri*; marginal teeth on fingers of chelicera much more numerous than in *bakeri*; tergal chætotaxy, 4 : 4 : 4 : 4 : 6 : 6 : 6 : 6; femur of palpus 5·6 times as long as broad; tibia about twice as long as broad; chela 5·9–6·0 times as long as broad; fingers about 1·5 to 1·6 times as long as hand.

DOUBTFUL GENUS.

Genus TYPLOCHTHONIUS, Balzan.

1891. Balzan, p. 546.

Type-species. Apparently a type-species was never assigned to this "genus," even by later inclusion, by Balzan. Ellingsen later referred his *pulchellus* to it. This latter species is quite possibly congeneric with the type of *Pseudochthonius*, but this cannot be ascertained in the absence of material.

Tribe LECHYTINI, nov.

Type. Genus *Lechytia*, Balzan.

Diagnosis. As given in key. Includes only the type-genus.

Genus LECHYTIA, Balzan.

1891. L. Balzan, p. 498.
1925. J. C. Chamberlin, p. 337.

Genotype. *Roncus chthoniiformis*, L. Balzan.

Diagnosis. Neither coxal spines nor intercoxal tubercle present; anterior margin of carapace not anteriorly produced; marginal teeth of fingers of chela close-set and contiguous (fig. 3 F); carapace bears about eighteen setæ; anterior eyes only present and weakly developed; tergal chætotaxy about 4 : 4 : 4 : 6 : 6 : 6 : 6.

Distribution. One species each from North and South America are known.

Lechytia chthoniiformis (Balzan).

1890. *Roncus chthoniiformis*, Balzan, pp. 45–46.
1891. *Lechytia chthoniiformis* (Balzan), Balzan, p. 498.

Remarks. Apparently close to the North American *L. pacifica* (Banks). I am not aware that it has been taken since its original discovery. The types are probably in E. Simon's collection.

Lechytia pacifica (Banks).

1893. *Roncus pacificus*, Banks, pp. 64–67.
1895. *Lechytia pacifica* (Banks), Banks, p. 13.
1925. *Lechytia pacifica* (Banks), Chamberlin, p. 337.

Remarks. Bank's original material of this species was from the State of Washington. I have since taken it in California (Chamberlin, 1925, p. 337).

Subfamily *TRIDENCHTHONIINÆ*, Hansen.

1894. *Tridenchthoniinæ*, Hansen, p. 232.
1891. *Tridenchthoniinæ*, Balzan, p. 505.
1925. *Tridenchthoniinæ*, Chamberlin, p. 334.

Type. Genus *Tridenchthonius*, Balzan.

Remarks. In the absence of material it is impossible properly to judge the real systematic value of this group. Balzan recognized it as of family rank, but for the present I prefer to follow Hansen's more conservative estimate. It includes, as its single representative, the only truly galeate chthoniid known.

Genus TRIDENCHTHONIUS, Balzan.

1888. L. Balzan, part i. no. 7.
1890. L. Balzan, p. 450, figs.
1906. C. With, p. 64.

Genotype. *Tridenchthonius parvulus*, Balzan.

Remarks. See references cited above for further data regarding this genus and its only representative. The tactile setæ of the hand of the chela number two, as in the Chthoniinæ.

Group HOMOSPHYRONIDA.

This group includes the two suborders, Monosphyronida and Diplosphyronida, and is to be considered equivalent, systematically speaking, to the Heterosphyronida just considered in detail.

An official taxonomic category between the order and suborder—or rather between the order and family—would be useful here and in similar cases.

Suborder Diplosphyronida, nov.

Type. Family Garypidæ, Hansen.

Remarks. Characters as given in key. Includes all species previously assigned to the families Obisiidæ and Garypidæ. It includes part of Balzan's untenable suborder Hemictenodactyli and part of the Panctenodactyli as well (Obisiidæ and Garypidæ, respectively).

Suborder Monosphyronida, nov.

Type. Family Cheliferidæ, Menge.

Remarks. Characters as given in key. Includes all species at present assigned to the families Cheliferidæ and Feællidæ. Corresponds to Balzan's Panctendactyli in part.

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VI.—*On some Essays and Proofs by Jacob Hübner.*

By CHARLES DAVIES SHERBORN.

BY the kindness of Mr. J. R. Loewe of Messrs. R. Friedlaender and Sohn of Berlin I have been favoured with the loan of a small collection of Essays and Proofs by Jacob Hübner which throw an interesting light on his method of working. These came direct from Hübner through Herrich-Schaeffer to the firm of Friedlaender and are now among the most cherished archives of that House.

Mr. Loewe has kindly given me permission to put them on record and to have them rotographed so that a set may be preserved in the British Museum (Natural History) and accessible to anyone interested. But it must be distinctly understood that so far as is known these are proofs, not published papers and cannot be quoted without express permission and then merely for bibliographical purposes.

Hagen (Bibl. Entom. 1862, p. 387) indeed quoted the "Abbildungen" but he says "Ich habe nirgends über dies Werk Aufschluss erhalten können; Vielleicht ist es der Schmutztitel zum folgenden" that is of the "Beiträge zur Geschichte der Schmetterlinge." Possibly this very proof may have been mentioned to him by Herrich-Schaeffer himself without any details.

The particulars of these documents are as follows:—

A. Four uncoloured impressions from engraved copper-plates (122 × 90 mm.)

"I." a butterfly (upper and side views) with autograph inscription "Meine ersten Versuche Jacob Hübner. 1784."

(II). a butterfly (upper and side views) with inscription "Erster Versuch von Jac. Hübner 1784."

(III). three moths (upper view) with "Erste Versuche von Jac. Hübner. 1784"

(IV). three moths (upper view) with "Meine ersten Versuche J. Hübner. 1784."

B. Sixteen pages octavo and three coloured plates (160× 80 mm. signed "Jacob Hübner f.", "Jacob Hübner del & fecit", and "Hübner fc" respectively. This is the projected work referred to by Hagen (see above) unhotpressed as received from the printer. It consists of Title-page, blank, "Vorbericht" 2 pp., "Beschreibungen . . ., pp. 5–16, pls. (I) 5 figures of moths (II) 7 figures of moths "III" 4 figures of moths.

The text deals with fifteen species the names of which for obvious reasons I do not quote. The Title-page printed reads as follows :—Abbildungen/und/Beschreibungen/noch nicht abgebildeter/und noch unbeschriebener/Schmetterlinge/mit illuminirten/Kupfern/von/Jacob Hübner./(Vignette, engraved, of an ornamental hemispherical wall-bracket with branches, a book within over which flies a swallow-tail butterfly, below a festoon of flowers) Augsburg 1785,/bei dem Verfasser./

This is sufficiently near to Hagen's entry to identify the two.

C. This proof appears to be Hübner's first attempt at a "Verzeichniss." It consists of

(1) an engraved Title-page reading :—
Verzeichniss/europäischer/Schmetterlinge/nach systematischer Ordnung ;/durch/Synonymen, Abbildungen u: Anmerkungen/erläutert/von/Jacob Hübner./ (Vignette of two cupids, one holding a stone tablet and the other writing upon it, with a bush on either side)/Augsburg CIↃ IↃ CCXCI./ Zu finden bei dem Verfasser./

(2) Half-title reading Der/Schmetterlinge/Lepidoptera/ Linnei,/europaisches Heer./; blank ; (pp. 3–16) I. Horde. Papiliones; Falter. under which are listed trivialia in families of I. Rotte containing Nymphales (Variegati; Phalerati; Undulati; Fasciati; Maculati; Gemmati), II. Rotte (Adolescentes; Equites; Danaides; Heliconii; Urbicolae).

There are no plates.

Although there is nothing except association to connect this Title-page and text with one another (or with the four plates described above) it is difficult to avoid the conclusion that the engraved Title and the text belong to the same essay.

I am greatly indebted to my friend Mr. Loewe for his generosity in allowing me the privilege of inspecting and making copies of these interesting papers which assist us greatly in understanding Hübner's methods, aims and results.

VII.—*Some new Carboniferous Lamellibranchs.* By A. E. Trueman, D.Sc., F.G.S., University College, Swansea.

In the course of recent studies in the distribution of the non-marine Lamellibranchs of the Coal Measures, it has been necessary to describe several new species of the genera *Carbonicola* and *Anthracomya* (Davies and Trueman, 1927). Most of these species have been from the Middle Coal Measures. In the present paper are descriptions of eight new species of *Carbonicola* and two new species of *Anthracomya*, most of these being from the Lower Coal Measures and Millstone Grit of Yorkshire. The additional names are needed for the adequate description of the sequence in those strata, since few existing names can strictly be applied to the shells which occur there.

Many of the specimens described are in the collection of the Museum of Practical Geology, and the writer wishes to thank Dr. F. L. Kitchin for opportunity to study them. To Mr. C. E. N. Bromehead and Dr. D. A. Wray he is also indebted for much information concerning the horizons of the specimens. For permission to examine specimens referred to below and for other assistance the writer thanks Dr. W. D. Lang (British Museum, Natural History), Prof. J. W. Gregory, Dr. E. Currie and Dr. J. Weir (of Glasgow), Mr. J. W. Jackson (of Manchester), Prof. W. G. Fearnsides and Mr. W. H. Wilcockson (of Sheffield), and Mr. T. Hallissy (of the Irish Geological Survey). Miss E. Dix and Mr. W. B. Wright have also given some assistance in the preparation of these notes.

This investigation has been assisted by a grant from the Grants Committee of the Royal Society.

Carbonicola.

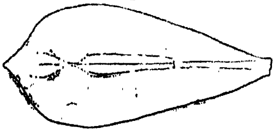
Carbonicola pseudorobusta, sp. n. (Fig. 1.)

Dimensions of holotype: length 87 mm.; height 65 per cent.; thickness 48 per cent.; anterior end 31 per cent.

This name is proposed to include many of the specimens which Wheelton Hind placed with *Carbonicola robusta* (J. de C. Sow.). The species has been recorded by Mr. S. G. Clift and the author from the *Ovalis* Zone of Nottinghamshire as *C. robusta,* Hind, *non* Sow. (1929, p. 83), but in view of its abundance and characteristic features it is probably desirable to give it a distinctive name.

The holotype, a specimen figured as *C. robusta* by Hind (1894, pl. i. fig. 1), is a triangular shell, very tumid. The umbones are prominent, swollen, contiguous. The anterior end is moderately long and is situated much below the level of the umbones. The anterior umbonal slope is almost straight, meeting the upper border of the somewhat compressed anterior end in a wide angle. The anterior superior angle is greater than a right angle; from it the border of the shell curves in a wide sweep, becoming straight and then reflected downwards before turning smoothly to meet the upper posterior border.

Fig. 1.



Carbonicola pseudorobusta, sp. n.

The holotype, seen in plan, less than half natural size. Lower Yard Seam, Fulledge Colliery, Burnley, Lancs.

The greatest tumidity is near the anterior end of the shell, almost immediately below or somewhat posterior to the umbones. The shell thence tapers rather evenly towards the posterior margin, but a wide constriction is present on the ventral part of the shell, and extends to the border just in front of the posterior inferior angle. Viewed from the end, the greatest tumidity is about one-third of the distance from the umbones to the ventral margin, but the shell is swollen and evenly rounded at the anterior end almost down to the lower margin.

The shell-substance is thick. Growth-lines are distinct, and those of the middle of the shell are not inclined to the lower margin. The concavity in the lower border is only shown by the growth-lines of the oldest part of the shell, the others being practically straight on the constricted part of the shell.

The hinge-line is long; external ligament very prominent. Lunule deep. The hinge-teeth are not seen in the holotype, but from other specimens it appears that they are variable in development (compare Clift and Trueman, 1929, p. 85).

This species differs from *C. robusta* (J. de C. Sow.) in its more robust and more transversely triangular form. The specimen chosen as holotype, now in the Manchester Museum, is that figured by Hind in 1894 (pl. i. fig. 1), from the Lower Yard Seam of Fulledge Colliery, Burnley, Lancs. Hind's figure gives a fairly accurate representation of the shell, but the suggestion of a concavity on the growth-lines of the middle part of the shell is misleading.

This species is known from many localities. Mr. W. B. Wright has traced its distribution in Lancashire, and it is also found at a comparable horizon in Yorkshire, Derbyshire, and Nottinghamshire. In Scotland it was recorded by Hind (1894, p. 47): typical specimens with dimensions closely comparable with those of the holotype, from the Dalmellington Colliery, Ayrshire, have been examined by the writer in the collection of the Hunterian Museum, Glasgow.

Carbonicola atra, sp. n.

Carbonicola aff. *fulva*, Davies and Trueman, 1927, pl. xvii. figs. 5 *a, b, c.*

Dimensions of holotype: length 45 mm.; height 47 per cent.; thickness 33 per cent.; anterior end 22 per cent.

An elongate pointed *Carbonicola.* The umbones are swollen and not much raised. The anterior umbonal slope is slightly hollowed, the anterior end being situated below the level of the umbones. The anterior border meets the anterior umbonal slope in an angle greater than a right angle, whence it curves smoothly into the lower border, which is slightly convex. The posterior end is sharply pointed.

The hinge-line extends for about half the length of the posterior end, the external ligament being rather prominent. Posterior to the ligament the valve-margins are bevelled almost as far as the posterior end of the shell. The lunule is well marked, but not very deep.

The shell has its greatest thickness just posterior to the umbones, and viewed in plan the shell tapers rather obtusely to the posterior end.

The shell is evenly tumid; when viewed from the end, the greatest thickness is about halfway between the hinge-line and the lower border. The low umbones and the wide hinge-region give the shell an appearance of being rather flattened dorsally.

The shell-substance is apparently thick, and is eroded somewhat near the umbones. The growth-lines are strongly marked and are not much inclined to the lower border.

C. atra is closely allied to *C. fulva*, with which it was formerly grouped. It resembles that species in general form, except that it is more elongate, and in the character of the umbones and the hinge-area. These two shells are associated in the roof of the Stwrin Vein at Ystalyfera, Glamorgan, where *C. fulva* is the common type. In parts of the north of England (in the *Similis-Pulchra* Zone), the species-group is more usually represented by *C. atra*, and it seems desirable to give it a separate name.

Holotype: the specimen figured by Davies and Trueman (1927, pl. xvii. figs. 5 *a*, *b*, *c*) from the roof of the Stwrin Vein (*Pulchra* Zone), the Patches, Ystalyfera, Glam., now in the British Museum (Natural History).

Carbonicola planitumida, sp. n.

Carbonicola aff. *aquilina* (J. de Sow.), Davies and Trueman, 1927, pl. xvii. figs. 1 *a*, *b*, *c*.
Compare *C. aquilina* (Brown, 1849, lxxxiii. 23).

Dimensions of holotype: length 35 mm.; height 46 per cent.; thickness 29 per cent.; anterior end 20 per cent.

This species is very closely allied to *C. aquilina* (J. de C. Sow.), and, although that name was restricted by Mr. J. H. Davies and the writer (1927, p. 226), the present species was then regarded as being sufficiently similar to Sowerby's types to justify its retention in *C. aquilina*. Recently, however, it has been shown that the species-group of *C. aquilina* has a considerable range and includes many forms which it will be desirable to distinguish, for stratigraphical purposes, by separate names. Accordingly, this species is separated from *C. aquilina*, a species which it resembles in hinge-characters and in the form of the anterior end, but from which it is distinguished by its more elongate form.

The holotype of *C. planitumida* is an elongate-oval shell. The umbones are elongate, not swollen and not much raised above the hinge-line. The anterior umbonal slope is distinctly hollowed, and the anterior end is compressed and small, and situated well below the level of the hinge-line. The anterior superior angle is not much greater than a right angle. From it the border of the shell curves downwards into the lower border, which is almost straight as far as the posterior end of the shell, where it turns rather sharply forwards.

The greatest tumidity is nearly halfway along the shell and is some distance behind the umbones. The shell remains relatively thick for the greater part of its length, but it is not very tumid, the sides being somewhat flattened, with the thickest part about halfway between the hinge-line and the lower border.

The ligament is prominent, long, a deep groove separating it from the inner posterior slope of the umbones.

The shell is marked by very strong and somewhat irregular growth-lines, those of the middle of the shell being distinctly inclined to the lower border.

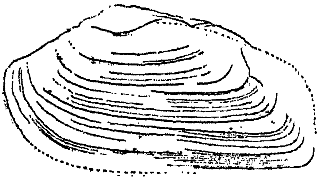
Holotype: the specimen figured by Davies and Trueman (1927, pl. xvii. figs. 1, *a*, *b*, *c*) from the Pennypieces Ironstone (*Pulchra* Zone), Ystalyfera, Glam., collected by Mr. J. H. Davies; now in the British Museum (Natural History).

Carbonicola recta, sp. n. (Fig. 2.)

Dimensions of holotype: estimated length 44 mm.; height 47 per cent.; anterior end ? 32 per cent.

An elongate *Carbonicola* with umbones not much raised. The anterior umbonal slope is slightly hollowed, the lower anterior margin of the shell meeting it in an angle of about 125 degrees. The lower anterior border sweeps in a wide curve into the lower border of the shell, which for the greater part of its length is practically straight, turning sharply upwards at the posterior end, which is truncate almost at right angles to the lower margin.

Fig. 2.



Carbonicola recta, sp. n.

Holotype, about natural size. Near the base of the Lower Coal Measures, in a boring at Oxspring, near Penistone, Yorks.

The shell is marked by strong growth-lines, which are almost parallel to the lower border, the growth-lines about a third of the way from the umbones being slightly inclined and faintly curved.

The shell-substance appears to have been thick. The hinge-characters are not determinable.

This species differs from members of the *C. aquilina* group, which it most resembles, in the absence of marked inclination in the growth-lines, in the blunt form of the posterior end, and in the long and well-developed anterior end.

Holotype: a specimen from near the base of the Lower Coal Measures, obtained from a boring at Oxspring, near

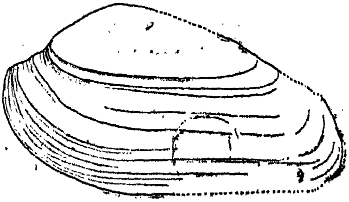
Penistone, about ten miles north-west of Sheffield (Geological Survey Collection, Ba. 676). Other specimens have been found at comparable horizons in borings at Huddersfield. In a boring at Phœnix Mills, Huddersfield, similar but smaller shells were found at about 150 feet above the Pot Clay Coal, the base of the Lower Coal Measures (Geological Survey Collection, Ba. 905): these specimens show some variation in shell-form, particularly in the ratio of height to length, and some are distinctly shorter than the holotype. The smaller shells are more oval, with lower borders more convex.

Carbonicola pseudacuta, sp. n. (Fig. 3.)

Dimensions of holotype: length 46 mm.; height 56 per cent.; anterior end 33 per cent.

A large *Carbonicola* with umbones raised above the level of the hinge-line, not much tilted. The anterior umbonal slope is markedly concave, meeting the anterior border of the shell in a distinct angle of somewhat more than 90 degrees. From this angle the margin passes in a sweeping curve into the lower border, which is almost straight, but shows a slight sinuation in the holotype. At the posterior end the lower border turns sharply upwards into the posterior slope, giving the shell a slightly truncate appearance.

Fig. 3.



Carbonicola pseudacuta, sp. n.

Holotype, about natural size. From the Millstone Grit in a boring at Victoria Mills, Huddersfield.

The shell is not well preserved in the holotype, but a number of pronounced ridges mark the form of the growth-lines. In the middle of the shell the growth-lines are straight and are practically parallel to the lower border. From the form of the growth-lines it appears that the young shell was much more elongate, and the posterior end much more pointed.

Another specimen (Geological Survey Collection, Ba. 933), from the same locality and horizon as the holotype, but not quite identical in shape, has the shell-surface better preserved, and exhibits regular radial markings, but the preservation of the holotype in a micaceous shale is too poor to show whether this character was present.

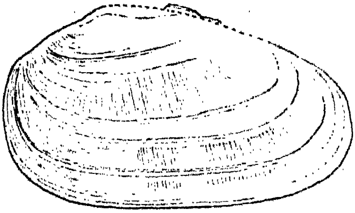
This species most closely resembles *C. acuta* (Sow.) in general form, but the hollowed lower border and the truncate form of the posterior end serve to distinguish it from that species. It is possible that it is more closely allied to *C. recta*, from which it differs in the more triangular form and the less truncate posterior end. Many of the characters of this species compare with those in shells of the group of *C. pseudorobusta*: thus it has a well-defined anterior end and a clearly marked anterior-superior angle, with a lower border sweeping posteriorly in a wide curve, and becoming straight or concave before reaching the "nose" at the posterior-inferior angle of the shell. *C. pseudacuta* differs from these shells, however, in that the growth-lines remain practically horizontal for the greater part of the length of the lower border, while in *C. pseudorobusta* and its allies they rise after passing under the umbonal region.

Holotype: a specimen from the Millstone Grit (about 300 feet below the Pot Clay Coal) in a boring at Victoria Mills, Huddersfield (Geological Survey Collection, Ba. 932).

Carbonicola ornata, sp. n. (Fig. 4.)

Dimensions of holotype: length 17 mm.; height 56 per cent.; anterior end ? 28 per cent.

Fig. 4.



Carbonicola ornata, sp. n.

Holotype, about twice natural size. From the Millstone Grit in a boring at Victoria Mills, Huddersfield.

A small shell, known only in partly crushed examples. The umbones appear to have been wide, projecting slightly above the level of the hinge-margin. The anterior umbonal slope is slightly hollowed. The anterior end of the shell is blunt, the margin curving rather sharply, almost through a right angle, to the lower border, which is nearly straight for some distance. The posterior end is bluntly rounded.

The shell is marked by numerous growth-lines, which in the middle of the shell are slightly inclined to the lower border and are distinctly curved. The growth-lines are of unequal strength. The shell is also ornamented by very fine and regular radial markings.

The shell appears to have been comparatively thick in the region of the hinge-line, but was perhaps thin near the posterior end.

A slab of shale from the same locality and horizon as the holotype shows over a hundred similar specimens, which exhibit considerable variations in proportions and in the form of the lower border, some specimens having a more convex lower border than the holotype, while in others the lower border is almost straight; in these latter the shell-form is very similar to that of *C. pseudacuta*, but they are much smaller than the holotype of that species and are not sufficiently elongate to be the young stages of it.

This species occurs at about the same horizon as *C. pseudacuta* and possibly is related to it, but the radial ornamentation characteristic of *C. ornata* is not seen in the holotype of *C. pseudacuta*, although it may originally have been present. In shape *C. ornata* is somewhat similar to *C. recta*, but it is smaller than that species, which also lacks the characteristic ornamentation of *C. ornata*.

Holotype: a specimen from the Millstone Grit (about 300 feet below the Pot Clay Coal) in a boring at Victoria Mills, Huddersfield (Geological Survey Collection, Ba. 934).

Carbonicola decorata, sp. n. (Fig. 5.)

Dimensions of holotype: length about 51 mm.; height 68 per cent.; anterior end 34 per cent.

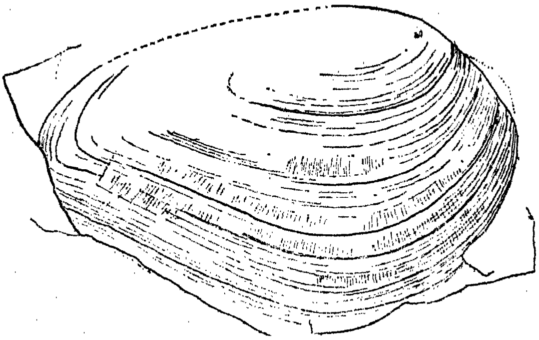
A large, radially striate *Carbonicola* with the general shape of *C. pseudorobusta*. In the holotype the umbones are not prominent and the hinge-characters cannot be determined. The anterior end is moderately long; the anterior umbonal slope is apparently not much hollowed and the anterior end is not placed far below the umbones. From the anterior end, the lower border of the shell sweeps in a wide curve to a point almost below the umbones, whence it turns upwards and remains almost straight as far as the posterior end, where it is slightly reflected. The posterior end is moderately sharp.

The holotype is somewhat crushed, but the shell appears to have been moderately tumid, with the greatest thickness below the umbones, and about halfway between them and the lower border.

The growth-lines are prominent, regular, and almost parallel with the border of the shell. The young shell was more elongate than the adult, and the sharp turn in the lower border was much less pronounced. The shell is also marked by radial striations which vary in distinctness in different parts of the shell; near the anterior end and on the earliest part of the shell they are very feeble, but on the middle of the shell and near the lower border they are very strongly marked, extending without interruption across the less prominent growth-lines.

This species appears to be distinguished by its radial ornamentation from most other forms of *Carbonicola*; from *C. ornata* it differs in shape.

Fig. 5.



Carbonicola decorata, sp. n.

Holotype, about natural size. From about the horizon of either the Whinmoor or Beeston Seam (*Ovalis* Zone), Caphouse Pit Dump, Overton, near Thornhill, Yorks.

Holotype: a specimen from the Caphouse Pit Dump, Overton, near Thornhill, Yorkshire (Geological Survey Collection, Tm. 494). Dr. D. A. Wray states that the horizon is approximately that of either the Whinmore or the Beeston Seam (*Ovalis* Zone). Associated with it was another radially marked specimen (the same collection, Tm. 495) which is more oval in form than the holotype of *C. decorata*.

Carbonicola regularis, sp. n. (Fig. 6.)

Dimensions.—

Holotype: length 23 mm.; height 64 per cent.; anterior end 31 per cent.

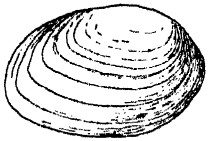
Paratype (a mould): length 22·5 mm.; height 64 per cent.; anterior end 30 per cent.

A larger crushed example (Tm. 491): length 37 mm.; height 63 per cent.; anterior end 33 per cent.

A small elliptical *Carbonicola*, with wide umbones somewhat swollen, raised above the level of the hinge-line. In the holotype, a solid shell preserved in ironstone, the hinge-line is not clearly seen, and, as most other specimens which have been examined are crushed, the external characters of the hinge are not known. The lunule appears to be small. The anterior end is rounded and not very distinct; the anterior border meets the anterior umbonal slope in a very obtuse angle, from which the shell-border curves smoothly backwards. The lower border is gently curved for most of its length, and passes with a slight angularity into the posterior end.

The shell is evenly tumid, the greatest thickness being immediately below the umbones, whence the shell tapers regularly to the posterior end. The thickest part is situated high on the shell, not more than one-third of the distance from the umbones to the lower border. The shell is covered by regular growth-lines, those of the middle part of the shell being only slightly inclined, and not more curved than those near the border. The young shell was apparently somewhat more elongate than the adult, but quite blunt at the posterior end.

Fig. 6.



Carbonicola regularis, sp. n.

Holotype, about natural size. From the Tankersley Ironstone, near Flockton, Yorks.

Holotype: a specimen from the Tankersley Ironstone (*Modiolaris* Zone) in a stream section at Hirby Wood, near Flockton, Yorkshire (Geological Survey Collection, Tm. 484).

At a horizon near to that of the holotype, above the Flockton Coal, occur larger crushed shells which may represent examples of this species. In these the growth-lines are more evenly curved and the angularity of the inferior posterior border is less marked, although it is still discernible.

A typical specimen from this horizon at Emley Moor, Flockton, Yorkshire (Geological Survey Collection, Tm. 491), is shown in fig. 8.

An internal mould of the shell which is closely related to this species is known from above the Flockton Thick Coal at the same locality (Geological Survey Collection, Tm. 493), and it may be regarded as a paratype of the species (fig. 7). In this the characters of the hinge-region are well shown. It appears that the shell-substance must have been of considerable thickness in this region. The moulds of the umbones are widely separated, the inner slope being markedly concave, especially near the anterior end. The hinge-line is shown in the mould by a sinuous ridge, representing the filling of the space between the hinge-plates of the opposite valves. From the form of this it is seen that several strongly developed cardinal teeth were present.

Fig. 7.

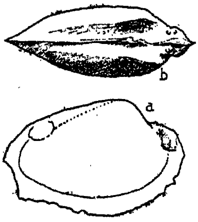


Fig. 8.

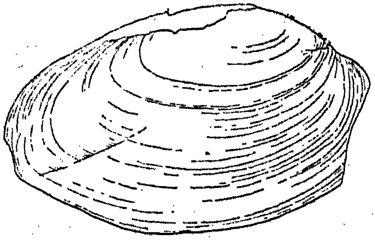


Fig. 7.—*Carbonicola regularis*, sp. n. Paratype, about natural size: *a*, from the side; *b*, in plan. From above the Flockton Thick Coal, Flockton, Yorks.

Fig 8.—*Carbonicola* cf. *regularis*, sp. n. A large crushed specimen, about natural size. From above the Flockton Coal, Emley Moor, Flockton, Yorks.

From this paratype it is also apparent that the anterior and posterior adductor muscles were well developed and of moderate size. Two prominent projections on each side near the anterior end mark the position of other small but deep muscle-scars. The pallial line is entire and shows a form similar to that of the growth-lines in the holotype, a slight angularity being present in the lower posterior region.

This species is similar in general shape to *C. venusta*, Davies and Trueman, but it is more elliptical, while the form of the umbones, particularly in the mould, indicates that it is in no way related to that species. It is perhaps more closely comparable in these features to *C. communis*, Davies and Trueman, and allied species; among these it resembles *C. rhomboidalis*, Hind, the lectotype of which is somewhat similar in general shape, but differs in having a straight lower border.

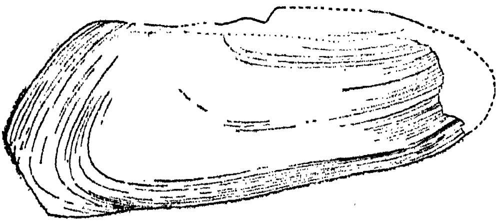
ANTHRACOMYA.

Anthracomya prisca, sp. n. (Fig. 9.)

Dimensions of holotype: length (estimated) 31 mm.; height about 40 per cent.; anterior end about 25 per cent.; β about 120°.

An elongate *Anthracomya* with a straight hinge-line, equal to about two-thirds the length of the shell. The umbones are not prominent and do not appear to have been raised above the hinge-line. The anterior end is small and somewhat indistinct in the holotype, which is not well preserved. The anterior border curves sharply into the lower border of the shell, which is straight or slightly sinuous for about two-thirds of the length of the shell. The lower border makes an angle of approximately 15 degrees with the hinge-line. Near the posterior end the border curves smoothly upwards and forwards, the posterior end being almost straight and making an angle of about 120 degrees with the hinge-line.

Fig. 9.



Anthracomya prisca, sp. n.

Holotype, about twice natural size. From near the base of the Lower Coal Measures, in a boring at Oxspring, near Penistone, Yorks.

The shell is ornamented by fine growth-lines, which in the middle of the shell are slightly inclined to the shell-margin.

The valve appears to have been evenly swollen, but not very tumid.

The shell most closely resembles *A. pumila*, Salter, and *A. obscura*, Davies and Trueman. It differs from these species, however, in the lower posterior angle, which is not so sharp, while the presence of a slight sinuation of the lower border is a further distinction.

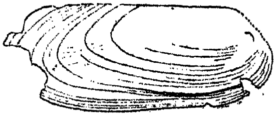
Holotype: a specimen from about 70 feet above the Pot Clay (that is, nearly at the base of the Lower Coal Measures) in a boring at Oxspring, near Penistone, about ten miles from Sheffield. (Geological Survey Collection, Ba. 668.)

Anthracomya lenisulcata, sp. n. (Fig. 10.)

Dimensions of holotype: length 43 mm.; height 37 per cent.; thickness ? about 23 per cent.; anterior end 23 per cent.; β 140 degrees.

An elongate *Anthracomya*, with umbones small and indistinct and not raised much above the hinge-line. The anterior end is short and not clearly seen in the holotype, but in a topotype it appears to be situated a little below the hinge-line. The anterior umbonal slope is slightly hollowed, meeting the anterior border in an angle. The anterior border curves smoothly into the lower border, which is almost straight, or slightly sinuous, curving sharply at the posterior end to join the hinge-line in a very obtuse angle.

Fig. 10.



Anthracomya lenisulcata, sp. n.

Holotype, about natural size. From the base of the Lower Coal Measures, in a boring at Phœnix Mills, Huddersfield.

The shell appears to have been thin, and is marked by regular and fine growth-lines, those of the middle of the shell being slightly curved and somewhat inclined to the lower border. Near the posterior end are suggestions of radial lines. The valves are evenly swollen, with the greatest thickness some distance behind the umbones. The umbonal slopes pass downwards without a suggestion of a carina, save that the posterior part of the shell, just below the hinge-line, is flat or slightly concave.

This species is distingished from the Anthracomyas of the *Modiolaris* Zone in the absence of a carina and in the feebleness of its sinuation. It resembles to some extent *A. bellula*, Bolton, from the Millstone Grit of Bonfire Hill, Crawshawbooth, Lancs. (Bolton, 1897, pl. v. fig. 5), especially in the wide angle β and in the form of the posterior end. The proportions and the form of the lower border suggest that the two shells are distinct, although they may be related.

The species also resembles *A. subparallela* (Portlock), especially the figure of that species given by Portlock (1843, pl. xxxv. fig. 16); the type of Portlock's species, however (figured by Hind, 1896, pl. xxi. fig. 2), differs from *A. lenisulcata* in its more pronounced sulcation and in the form of the posterior end, the angle β being much smaller than in *A. lenisulcata*.

With the holotype of *A. lenisulcata* occurred a specimen (Geological Survey Collection, Ba. 918) in which the lower border is almost straight or gently convex, but which in its other characters resembles *A. lenisulcata*. This specimen is somewhat crushed and it is uncertain whether it represents a distinct species or whether it is a variant of *A. lenisulcata*; it closely resembles the specimen figured by Hind as *A. subparallela*, from Ballycastle, Antrim (1895, pl. xvii. fig. 2).

In certain characters *A. lenisulcata* also resembles the shell figured as *A. wardi* (but unquestionably not that species), from the Possil Lower Ironstone, Scotland (1896, pl. xxi. fig. 10), but both this horizon and the strata at Ballycastle are of Lower Carboniferous age.

A. lenisulcata occurs in the Lower Coal Measures, and may prove of some importance in the correlation of the lower measures. It is notable that this species as well as *A. bellula*, and possibly some other forms which occur at low horizons in the Upper Carboniferous, agree in having a very wide angle β.

Holotype: a specimen from immediately over the Pot Clay Coal, at the base of the Lower Coal Measures, from a boring at Phœnix Mills, Huddersfield (Geological Survey Collection, Ba. 914).

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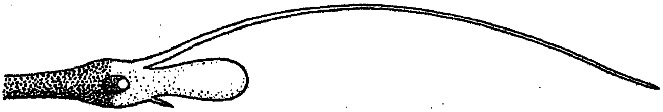
VIII.—*Description of a new Stomiatoid Fish of the Genus* Borostomias *from the Atlantic.* By C. TATE REGAN, D.Sc., F.R.S., and ETHELWYNN TREWAVAS, B.Sc.

Borostomias roulei, sp. n.

Depth of the body 6 in the length, length of head $4\frac{1}{2}$. Diameter of eye $5\frac{1}{2}$ in length of head. Postocular luminous organ double, the posterior part $\frac{1}{4}$ to $\frac{1}{3}$ diameter of eye, the anterior part much smaller. Lower jaw prominent, nearly as long as head; maxillary with 7 teeth. Barbel, to end of bulb, $\frac{3}{4}$ length of head; stem pigmented, somewhat swollen and bearing a pair of small luminous bodies proximal to bulb; bulb white, about $\frac{1}{10}$ length of head, with a pair of filaments at its base, one very short, the other nearly $\frac{1}{2}$ as long as the barbel proper. Dorsal 12, originating a little behind pelvics, ending far in front of anal. Anal 15. Pectoral 8. Pelvics 7-rayed, in middle of length. Lateral photophores O.–V. ca. 22; V.–A. ca. 18; A.–C. 12, forming a regular series.



Borostomias roulei, sp. n. End of barbel.

Atlantic (Station 3414, Prince of Monaco, 1913).

A single specimen, 150 mm. in length to base of caudal, sent to us for examination by Professor Louis Roule.

In our report on the Astronesthidæ collected by the 'Dana' ('Dana' Expedition, Oceanographical Report, No. 5, Copenhagen, May 1929) we described a new genus—*Diplolychnus*—distinguished from *Borostomias* by the double postocular luminous organ, the smaller fangs of the præmaxillaries and lower jaw, the more numerous maxillary teeth, and the absence of a post-temporal. *Borostomias roulei* resembles *Diplolychnus* in the structure of the postocular organ, but is a true *Borostomias* in other respects. The post-temporal is somewhat shorter and broader than is usual in the genus, approaching in form that of *Astronesthes*. *Borostomias macristius* from the Gulf of Panama has a somewhat similar barbel, but differs considerably from *B. roulei* in other characters, particularly the simple postocular organ and the much longer dorsal fin.

IX.—*Exotic Muscaridæ* (Diptera).—XXVI. By J. R. Malloch, Bureau of Biological Survey, Washington, D.C.

Family Sapromyzidæ.

Genus Arnomyia, nov.

In Hendel's recent key to the genera of this family * this genus runs down to *Mallochomyza*, Hendel (=*Homoneura*, van der Wulp), but it is readily distinguished from it by the flat, subquadrate frons, which is covered with quite closely-set microscopic black hairs, and has no differentiated orbital stripes. The two pairs of orbital bristles are backwardly directed, the arista is moderately long-haired; the thorax has three pairs of postsutural dorsocentrals and three or four pairs of acrostichals, when there are four pairs present the anterior pair is quite weak and a little in front of the suture; the propleural bristle is present, stigmatal bristle absent, there are two sternopleurals present, and the prosternum is haired. Fore femur without a distinct preapical anteroventral comb. Wings as in typical *Homoneura* species.

Genotype, the following species.

Arnomyia nubeculosa, sp. n.

Male and *female*.—Shining testaceous-yellow, frons and face more whitish yellow, a brown mark extending over lower portion of parafacials and anterior portion of the cheeks, vertex and upper portion of occiput irregularly marked with brown, abdomen with three series of large black dorsal spots forming almost complete vittæ on second to fourth tergites, the lateral series faint in the females; apical two segments of all tarsi deep black; wing with a large fuscous apical mark, shortest on apex of second vein and usually divided longitudinally by a hyaline streak in apex of marginal cell, extending basally along fourth vein to the outer cross-vein, the latter entirely enclosed in the fuscous mark, second posterior cell largely hyaline, inner cross-vein not clouded. Calyptræ and halteres yellow.

Frons almost flat, a little longer than wide, nearly twice as wide as one eye, anterior orbital bristle normally well above middle of frons and shorter than the posterior one; posterior ocelli on vertex; ocellar bristles very small and fine; postvertical bristles situated well below vertex, widely separated and well developed; all four verticals long;

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* Encycl. Ent. Diptera, vol. i. fasc. 3, 1926.

longest hairs on arista about half as long as width of third antennal segment; antennæ of moderate size, third segment about twice as long as wide, rounded at apex; frons in profile slightly projecting; face flat, cheek about as high as width of third antennal segment, margined with black hairs; eye narrowed below, slightly emarginate behind on lower half; palpi normal. Thorax with 8–10 series of intradorsocentral hairs; mesopleura with one bristle; scutellum flat above, subtruncate at apex, with four equal bristles. Abdomen stout, apical bristles on tergites rather long. Legs normal, basal segment of tarsi on all legs longer than the others combined. Inner cross-vein close to middle of discal cell; penultimate section of fourth vein almost as long as its ultimate section; first posterior cell not narrowed at apex.

Length 4–5 mm.

Type, male, allotype, and four paratypes, Matasia, Society Islands, viii. 1928 (*A. Tonnoir*).

One specimen deposited in British Museum.

This genus is dedicated to Mr. C. G. Lamb, of Cambridge, in appreciation of his work on Acalyptrate Diptera.

Family **Clusioididæ**.

Information regarding the occurrence of members of this family in the Australasian region is very meagre. Bezzi recently described a species of *Heteromeringia*, Czerny, from the Fiji Islands, and previously I had described one species of the same genus from Australia. I have seen one genus from the Samoan Islands, and have before me now a new genus from the Society Islands.

Genus TONNOIRIA, nov.

In the key to the genera of this family published by Melander & Argo* this genus will run down to caption 2, but it does not agree with either section under that caption, one having all the fronto-orbital bristles reclinate, and the other having the anterior pair proclinate or convergent. In *Tonnoiria* the second pair of orbital bristles are convergent, the first pair reclinate.

Frons at upper angles of eyes about one-third of the head-width, slightly widened in front, the eye-margins a little emarginate, greatest length of frons equal to over 1·5 its width at upper angles of eyes, ocellars divergent, slightly shorter than the divergent postvertical pair, verticals apparently all developed, but the inner pair rubbed off in the type-specimen, each orbit with three bristles, the anterior and posterior reclinate, the middle one directed inward and slightly forward, no interfrontal bristles present; antennæ normal; arista short-haired. Thorax with two pairs of long postsutural dorsocentrals, and a very short pair in front of them, one sternopleural, one mesopleural, and two long scutellars. Legs moderately strong, mid and hind tibiæ with a distinct preapical dorsal bristle. Auxiliary and first veins very close together on their entire length; costa slightly interrupted at apex of the auxiliary vein.

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* Proc. U.S. Nat. Mus. vol. lxiv. art. 11, p. 4, 1924.

Genotype, the following species.

Tonnoiria palliseta, sp. n.

Male.—Shining black, anterior portion of frons orange-yellow, antennæ yellow, face and cheeks almost white, lower half of pleura and the entire legs pale yellow, wings fuscous, paler at bases, halteres pale yellow, all bristles and hairs on head, thorax, and legs yellow, abdominal hairs black.

Eyes slightly oblique, lower posterior outline slightly emarginate; parafacials invisible in profile; cheek at middle not as high as width of third antennal segment. Dorsum of thorax with rather dense decumbent hairs; scutellum small, with four short setulose hairs in addition to the two long apical bristles; sides of prosternum haired. Abdomen cylindrical, longer than thorax. Femora quite stout, mid-pair with a rather close-set series of short posteroventral bristles. Inner cross-vein at one-third from apex of discal cell, penultimate section of fourth vein about half as long as ultimate section of fifth vein and about one-fifth as long as ultimate section of fourth.

Length 3·25 mm.

Type, Moorea, Society Islands, viii. 1928 (*A. Tonnoir*).

There are no vibrissæ present on the type-specimen, but I believe I can detect the insertion-scars indicating that they have been rubbed off.

This genus is dedicated to Dr. A. Tonnoir, of the Cawthorn Institute, New Zealand, who collected this and many other interesting species in the Australasian region.

Family Ortalidæ.

Genus Scholastes, Loew.

Scholastes lonchifera, Hendel.

Four specimens of this species from Moorea, Society Islands, viii. 1928 (*A. Tonnoir*).

One specimen will be sent to the British Museum.

Genus PSEUDORICHARDIA, Hendel.

Pseudorichardia flavitarsis (Macquart).

Three specimens of this species from Moorea, Society Islands, viii. 1928 (*A. Tonnoir*).

Genus RIVELLIA, Robineau-Desvoidy.

Rivellia connata, Thomson.

Four specimens of this species from Moorea, Society Islands, viii. 1928 (*A. Tonnoir*).

Only the first of the above three species is rather local, the other two are quite widely distributed in the same region, *connata* being particularly common in Australia.

Family **Trypetidæ.**

Genus PAROXYNA, Hendel.

Paroxyna sororcula (Wiedemann).

One specimen, Moorea, Society Islands, viii. 1928 (*A. Tonnoir*).

This common species is very widely distributed throughout the tropical and subtropical regions of both hemispheres, possibly through the agency of commerce.

Family **Muscidæ.**

Subfamily *ANTHOMYIINÆ.*

Genus CIRCIA, nov.

This genus is most nearly related to *Fucellia*, Robineau-Desvoidy, but it is readily distinguished from it, and practically all genera of Anthomyiinæ, by the possession of but one pair of presutural dorsocentral bristles on the thorax. In addition to this character there are but two sternopleural bristles present (1 + 1), the cruciate interfrontal bristles are extremely small and weak, almost lacking sometimes, and the prosternal plate is rather narrow. The costa has longer bristles than in any of the known species of *Fucellia*, and the ventral surface of the scutellum has no fine hairs.

Genotype, the following species.

Circia tinctipennis, sp. n.

Male and *female*.—Black, densely pale grey dusted. Head densely whitish-grey dusted, the face and cheeks almost silvery, antennæ and palpi black. Dorsum of thorax with three or five diffuse brown vittæ which are confluent centrally and incomplete. Abdomen with faintly indicated dark apices to tergites, and in the male with a slightly darker central line. Legs black, tibiæ rufous, all grey-dusted. Wings slightly tinged with fuscous, whitish on disc from near base to outer cross-vein, both cross-veins distinctly clouded with fuscous. Calyptræ white. Halteres yellow.

Frons in both sexes longer than wide, less than one-half of the head-width, vertical bristles strong, postverticals microscopic, each orbit with the upper bristle curved backward, second directed forward, the others incurved, cruciate interfrontals microscopic; antennæ long, third segment about twice as long as second; arista bare; vibrissal angle not noticeably produced, with two or more subequal bristles; cheek over half as high as eye, the latter slightly oblique, as long as high. Thorax with 1+3 pairs of dorsocentrals, presutural acrostichal hairs weak, two-rowed; prealar lacking. Abdomen subcylindrical, without strong apical bristles on tergites; hypopygium of male thick, prominent, fifth sternite of same sex with the processes stout, and rounded at apices; genital segment of female with ten short curved thorns. Fore tibiæ with one or two anterodorsal bristles; mid-femur in male with a few long bristles on basal half, and a series of short, closer-placed bristles on apical half of posteroventral surface; mid-tibia with one long, and one to three short, bristles irregularly arranged on anterior and posterior surfaces; hind femur bristled on anteroventral and posteroventral surfaces, those on former surface not extending to apex; hind tibia with two or three anterodorsal and posterodorsal bristles, and usually one on anteroventral surface. Costal spines about as long as width of marginal cell; ultimate section of fourth vein hardly longer than penultimate section.

Length 6·5–7·5 mm.

Type, male, and allotype, Banff, Alberta, Canada, 19. viii. 1925, lake shore, 4500 feet (*O. Bryant*); paratype, female, Skagway, Alaska, 4. vi. 1921, beside stream from glacier (*J. M. Aldrich*). United States National Museum.

Genus NEOPEGOMYIA, nov.

This genus is most closely allied to *Emmesomyia*, Malloch, and *Tæniomyia*, Stein, having one or two bristles on the upper margin of the pteropleura, but it differs in having the third wing setulose on almost its entire length both above and below, a character that is unique in this subfamily so far as I am aware.

Genotype, the following species.

Neopegomyia orientalis, sp. n.

Female.—Head black, with white dust, most conspicuous on anterior portions of frontal orbits and the parafacials; frontal orbits on posterior third or less, and the frontal triangle, glossy black; antennæ fuscous, third segment and aristæ brown; palpi fuscous. Thorax shining black, mesonotum when seen from behind with a broad white-dusted central vitta which is most distinct in front of suture, and a similar, but more conspicuous, vitta on each lateral margin; pleura white-dusted; scutellum brownish-grey dusted on disc. Abdomen shining testaceous-yellow, with a narrow black apex to each tergite, a black mark on each side of first visible tergite, and a rather broad black median vitta on the others which connects with the black apical margins. Legs black, trochanters, tibiæ, and tarsi tawny yellow. Wings hyaline, veins yellowish. Calyptræ yellowish-white. Halteres yellow.

Frons at vertex hardly over one-fifth of the head-width, becoming generally wider to anterior margin, orbits linear above, widened anteriorly, the interfrontalia of uniform width throughout its entire length; bristles normal, as in *Pegomyia*, the cruciate pair well developed; third antennal segment fully three times as long as second, and about twice as wide as height of cheek; arista very short-haired on entire length, the longest hairs fully as long as its basal diameter; palpi slightly club-shaped. Presutural acrostichals in three pairs, second pair longest, widely separated; prealar rather short; sternopleurals 1+2, lower posterior one short; one long and one short pteropleural bristle on upper margin. Genitalia not thorned. Fore tibia with one median posterior bristle; mid-tibia with three irregularly arranged posterior bristles and no ventral bristle; hind tibia with one anteroventral, three anterodorsal, and two posterodorsal bristles, all short. Costal thorn very short; inner cross-vein at a little over one-third from apex of discal cell. Lower calypter fully twice as long as upper one.

Length 5·5 mm.

Type, Mt. Banahao, Philippine Islands (*C. F. Baker*).

In author's collection.

It appears probable that *Hydrophoria setinervis*, Stein, from Africa, belongs here also.

Subfamily *PHAONIINÆ*.

Genus APSIL, nov.

An aberrant genus with the facies of a *Lispa*, the dilated palpi and broad frons of which are duplicated here. There, however, the similarity ends, the pteropleura and parafacials being bare, and the frons, though broad in the female, differs from nearly all genera in this subfamily in being narrowed in front and behind as in *Schœnomyza*, and in having but one backwardly inclined bristle instead of two such on the upper part of each orbit. The arista is very short-haired, the vibrissal angles are not produced, the face is flat, the thorax is similar to that of *Limnophora*, Robineau-Desvoidy, but the prosternum is bare, the wing-veins lack bristles, and the fourth wing-vein is not curved forward at apex.

Genotype, the following species.

Apsil maculiventris, sp. n.

Male.—Black, densely covered with pale grey dust. Frontal orbits and triangle paler than interfrontalia, the latter brownish grey, vertex with a dark brown dot at base on each of the pair of inner vertical bristles; anterior half of cheeks, and to a lesser degree the lower portions of parafacials, golden-yellow dusted; antennæ and bases of aristæ testaceous-yellow, remainder of aristæ dark brown; palpi testaceous, apical dilated portions silvery-white dusted. Thorax with a broad dark brown sublateral vitta on each side of mesonotum which is cleft on posterior half of its extent behind suture, a pair of dark submedian vittæ in front of suture which almost connect with a dark brown irregular mark on middle of suture, a more or less evident dark brown dot at base of each dorsal bristle, a similarly coloured mark on each basal angle of scutellum, and another near middle of mesopleura. Abdomen with a pair of large subtriangular dark brown marks on each tergite from first to third, and a pair of sublinear marks of same colour on fourth. Legs fuscous, femora densely grey-dusted, tibiæ and tarsi fulvous-yellow, bases of latter darker above. Wings greyish hyaline, whitish at bases, both cross-veins narrowly infuscated. Calyptræ whitish-yellow. Halteres yellow.

Frons at vertex fully one-third of the head-width, widened to middle and narrowed from there to anterior margin giving the eye-margins a concave appearance; ocellars, postverticals, and verticals all well developed, inner verticals longest, one backwardly inclined posterior and about five incurved anterior bristles on each orbit, the lateral edges of each orbit anteriorly finely haired; triangle extending to anterior margin, narrow; face vertical; antennæ extending about three-fifths of the distance to mouth-margin, third segment about twice as long as second; aristæ fully as long as greatest width of frons, very short-haired on basal halves; vibrissal angle not produced; cheek about three times as high as width of third antennal segment; palpi abruptly dilated on apical third; facial ridges with one or two setulæ and some hairs above vibrissæ; occiput with its longest bristles on upper half near centre on each side. Thorax with 2 + 3 pairs of dorsocentral bristles, and very few dorsal hairs, scutellar bristles 4; sternopleurals 3. Abdomen stout, subcylindrical, hypopygium large, fifth sternite glossy castaneous, protruded downward, bare except on edges. Legs strong, hind femora stoutest; fore femur with the posteroventral bristles uniseriate and moderately strong, becoming multiseriate and finer at base; fore tibia with a median posteroventral bristle; fore tarsus a little shorter than tibia, normal; mid-femur with some long posteroventral bristles on basal half; mid-tibia with one anterodorsal and one posterodorsal bristle; hind femur with a dense clump of short hairs near base on posterior surface which are inclined slightly towards base, some short fine bristles on basal half of posteroventral, and a complete series of long and strong bristles on anteroventral, surface; hind tibia with one erect median anterior bristle, three or four anteroventral bristles, the two or three nearest middle sloping slightly towards base of tibia, and a series of long erect fine bristles on apical half of dorsal surface which become shorter and multiseriate apically and extend on the posterodorsal surface; hind tarsus thick at base, tapered to apex, hardly more than half as long as the tibia. Outer cross-vein of wing about two-fifths from apex of discal cell.

Length 6·5 mm.

Type and one paratype, Perales, Chile, i. 1926 (*C. H. T. Townsend*). United States National Museum.

Apparently an aquatic form, judging from its resemblance to *Lispa* and *Limnophora.*

Genus Peruvia, nov.

I have seen only the female of the genotype. It is remarkable in the armature of the frons and thorax. Head broader than high, space between eyes at antennal insertions distinctly less than one-third of the head-width; height of head in profile about twice as great as its greatest length; frons at vertex less than one-fourth of the head-width, below level of upper margins of eyes, ocellar bristles lacking, postverticals and outer verticals very short, inner verticals long and strong, upper two-fifths or more of each orbit without hairs or bristles, anterior three-fifths with three long and strong bristles and three or four setulose hairs between them, the upper pair of bristles curved outward over eyes and but slightly backwardly sloped, almost erect, second pair sloped inward and backward, anterior pair incurved; antennæ extending almost to mouth-margin, third segment about eight times as long as second; aristæ plumose; occiput with its longest bristles on middle of lateral portions of upper half. Thorax with 1+3 pairs of strong dorsocentrals; only one pair of prescutellar acrostichals present; prealar absent; three sternopleurals; prosternum, propleura, pteropleura hypopleura, postalar declivity, and postnotum bare. All wing-veins without setulæ, fourth with a very slight forward inclination apically. Lower calypter narrow, rounded at apex, projecting. Mid-tibia without a ventral bristle; hind tibia with one anterodorsal and four or five anteroventral bristles.

Genotype, *Mydæa singularis*, Stein.

Peruvia singularis (Stein).

I have seen but one female of this species, which is unique in certain of its characters, so far as I am aware at this time. It is fulvous in colour, resembling in this respect the genotype of *Charadrella*, van der Wulp, with a faint darkening on the dorsum of abdomen, most distinct on the central vitta, the hind tarsi are fuscous, and the wings are brownish hyaline.

Length 8·5 mm.

Locality. Masisea, Peru, October 2, in forest (*Townsend*). United States National Museum.

Genus DIMORPHIA, Malloch.

I have recently received some material belonging to this African genus, and below present a key to the species now known to me, with records of same.

Key to the Species.

1. Antennæ and palpi entirely orange-yellow .... 2.
Antennæ with at least third segment largely or entirely black.......................... 4.
2. Each frontal orbit with two uppermost, or posterior, bristles reclinate and longer than the

ocellar bristles (fig. 1); fourth wing-vein not much curved at apex, the first posterior cell therefore fully as wide at apex as at level of outer cross-vein; thorax entirely fulvous-testaceous (male) .... *latifrons*, sp. n.

Each frontal orbit with the upper, or posterior, third with fine hairs, the uppermost usually proclinate, all very much shorter than the ocellar bristles (fig. 2); fourth wing-vein very distinctly curved forward at apex, the first posterior cell therefore not as wide at apex as at level of outer cross-vein .... 3.

3. Thorax entirely yellow in female, with one or three dark dorsal vittæ in the male, the central one always distinct and rather broad; frons of male hardly wider than the third antennal segment .... *flavithorax*, Mall.

Thorax largely fuscous in both sexes, mesonotum entirely so and densely yellowish-grey dusted; frons of male fully twice as wide as the third antennal segment .... *flavicornis* (Macq.).

4. Basal two antennal segments rufous-yellow, third deep black; palpi rufous-yellow; mesonotum seen from behind with the unaided eye with two submedian linear, and two broad sublateral, black vittæ .... *tristis* (Wied.).

Antennæ entirely black; palpi black or fuscous, sometimes paler at bases .... 5.

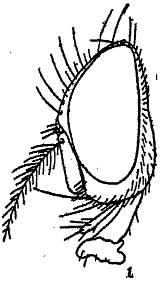
5. Mesonotum of female broadly pale on lateral margins; scutellum yellow in both sexes; abdomen yellow, darkened in centre of tergites 3 and 4 .... *nigricornis*, sp. n.

Mesonotum of female shining black, grey-dusted, with four black vittæ; scutellum broadly fuscous, the margin yellowish; abdomen fuscous on dorsum except the basal tergite, densely brownish-grey dusted .... *fusciventris*, sp. n.

Dimorphia latifrons, sp. n.

Male.—Head black, white-dusted, facial ridges showing yellowish underneath the dust; antennæ and palpi pale orange-yellow. Thorax and abdomen shining fulvous-yellow, mesonotum with slight grey dust, forming three vittæ anteriorly, the central one broadest; postnotum fuscous in centre; abdomen in the type greasy, but apparently with a dark central apical mark on second visible tergite, most of third tergite and all of fourth on dorsal exposure dark and with brown dusting. Wings yellowish hyaline. Calyptræ and halteres yellow.

Head in profile as in fig. 1; frons about twice as wide as third antennal segment, the latter longer and wider than in any of the other species. Thorax with the normal bristling, the dorsocentrals 2+4. Third and fourth visible tergites of abdomen each with an apical series of long erect bristles, fourth with a similar discal series. Legs as in the other species. First wing-vein with some minute setulæ on the underside before and beyond humeral cross-vein, second vein setulose above and below before furcation with third, the latter with one or two setulæ above and below proximad of inner cross-vein; fourth vein setulose above and below on its second section; apex of first posterior cell wider than same cell at level of outer cross-vein.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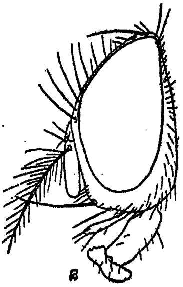
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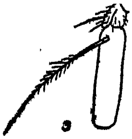
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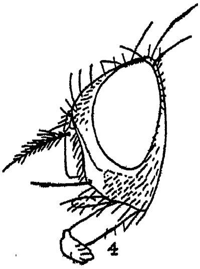
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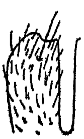
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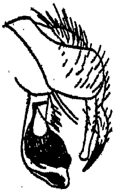
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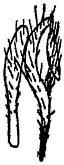
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Fig. 1.—Head of *Dimorphia latifrons*, from the side.
Fig. 2.—Head of *Dimorphia flavithorax*, from the side.
Fig. 3.—Antenna of *Kenia flavida*.
Fig. 4.—Head of *Keniella somereni*, from the side.
Fig. 5.—Fifth abdominal sternite of *Keniella somereni*, one half.
Fig. 6.—Hypopygium of *Keniella somereni*, male, from the side.
Fig. 7.—Hypopygium of *Keniella somereni*, male, from the rear, one half.

Length 7 mm.

Type, Mt. Mlanje, Nyasaland, 26. viii. 1913 (*S. A. Neave*) British Museum.

Dimorphia flavicornis (Macquart).

This species may be readily distinguished from its allies by the bright orange-yellow antennæ and palpi the fuscous, densely grey-dusted thorax has four narrow dark vittæ on mesonotum, and when seen from in front from one side against the light there is a large subquadrate paler grey dusted mark readily visible; the abdomen is translucent yellow, with fuscous central marks on the apical two tergites which are obscured by grey dust.

Localities. — Embu, Kenya Colony, 11. ix. 1913; and Nairobi, Kenya Colony, June 1928 (*Dr. Van Someren*).

Dimorphia flavithorax, Malloch.

The thorax is fulvous to testaceous in colour in this species, variably vittate on dorsum in the male, and the abdomen is concolorous, with more conspicuous and extensive apical blackish markings on dorsum in the male.

I have seen only one male from Kyambu (*J. C. Cook*, Nairobi Museum), and the original series from Natal.

Dimorphia tristis (Wiedemann).

The specimens of this species before me average rather larger than do those of the other species, being about 9·5 mm. in length. The thoracic dorsum is more obviously quadrivittate when seen by the unaided eye than in the others, which have the mesonotum densely grey-dusted. The abdomen has a dark dorsocentral line from base and most of the third and fourth visible tergites dark in the male. The only female I have is considerably paler than the male, and the abdomen is not noticeably marked with black, but it appears to be slightly teneral, so that it may be paler than normal specimens.

Locality.—Durban, Natal (*A. L. Bevis*).

Dimorphia nigricornis, sp. n.

This species is very similar to *flavicornis* in habitus and coloration. The head is entirely black, basal two antennal segments, and bases of palpi sometimes, brownish. Thoracic dorsum densely grey-dusted, with four narrow dark vittæ, the lateral margins slightly yellowish in male, broadly so in female; scutellum yellow. Abdomen translucent yellow, apical two tergites largely blackened centrally, and rarely a narrow dark central line on basal tergites. Legs yellow, apices of tarsi dark. Wings slightly brownish, narrowly so on some of the veins when seen against the light. Calyptræ and halteres yellow.

Frons of male at narrowest point not twice as wide as third antennal segment, orbits quite strongly bristled on anterior two-thirds, with hairs on posterior thirds. Thorax with the usual bristles, 2+4 dorsocentrals, one pair of prescutellar acrostichals, one intra-alar, the prealar very short, and 1+2 sternopleurals; scutellum elongate as usual. Legs as in the other species.

Length 8–9 mm.

Type, male, allotype, and four male and one female paratypes, Nairobi, Kenya Colony, June 1928 (*Dr. Van Someren*); three male paratypes, Durban, Natal, 2. vi. 1917 and 3. vii. 1916 (*C. N. Barker*); one female paratype, Lorenço Marques, Portuguese East Africa, 1909 (*J. de O. S. de Azevedo*); British Museum.

Dimorphia fusciventris, sp. n.

This species is the darkest-coloured one of the genus known to me. The head is entirely black, the mesonotum is shining black, with slight greyish dusting and four black vittæ, the disc of scutellum is concolorous with the mesonotum and its margin is yellowish; pleura fulvous-yellow, upper posterior angle of mesopleura black; postnotum black. Abdomen brownish-yellow, dorsum blackish-brown except first tergite, and rather densely brownish-dusted. Legs coloured as pleura. Wings brownish hyaline. Calyptræ and halteres dusky yellow.

Structurally similar to the other species, apex of first posterior cell of wing widely open, distance along costa between veins 3 and 4 fully three times as great as length of inner cross-vein.

Length 7·5 mm.

Type, Nairobi, Kenya Colony, June 1928 (*Dr. Van Someren*); British Museum.

Genus DICHÆTOMYIA, Malloch.

Dichætomyia pallitarsis (Stein).

A male of this species recently received bears the first record of the larval habits.

Locality.—Kuala Pilah, Malaya, 24. ix. 1926, "ex Pyralid larva boring padi stems" (*G. H. Corbett*).

The species is abnormal, possessing a broad frons in the male, but I do not consider it wise to erect a new genus for its reception, as the female is not readily distinguishable from some others that belong to species in which the males have the frons narrow. One African species, *latifrons*, Malloch, is very similar to this one, but nothing is known of its larval food-habits.

Subfamily *Muscinæ*.

Genus Byomya, Robineau-Desvoidy.

In this genus, which is generally accepted as a subgenus of *Musca*, Linné, there are a number of species which possess a well-developed submedian bristle on the posterior surface of the fore tibia. I have no undoubted examples of *tempestiva*, Fallén, before me, but am inclined to consider that it belongs to this segregate of the genus. There are three other species known to me, two of them Oriental and one African, with apparently one of the former extending its range to West Africa.

I have recently published a key to the Sumatran species of this genus and in it included *conducens*, Walker, and and *planiceps*, Wiedemann*.

Bezzi included *tempestiva*, Fallén, and *tempestatum*, Bezzi, in a key published in 1911 †. The last author also included a new species, *pulla*, Bezzi, but it was not located close to the other two, being placed in another subgenus. I have examined the type-specimen of this species and find that it is indistinguishable from *conducens*, so I refer to it under that name herein.

Accepting *tempestiva* as belonging here, the key presented below should suffice for the separation of the species involved, at least in the male sex.

Key to the Species.

1. Thoracic dorsum shining black, not vittate; abdomen of male black, nowhere translucent yellow; two pairs of distinct presutural dorsocentrals on thorax .... *tempestiva*, Fln.

Thoracic dorsum greyish or yellowish dusted, sometimes shining, but always with four distinct blackish vittæ .... 2.

2. Only one very short pair of dorsocentral bristles in front of, and very close to, suture; abdomen entirely black in both sexes, with dense grey markings and nowhere yellow .... *tempestatum*, Bez.

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* Ent. Mitt. xvii. no. 5, p. 332 (1928).

† Boll. d. Labor. d. Zool. gen. e agar. Portici, vi. p. 85.

Two pairs of well-developed presutural dorsocentrals present; abdomen in the male partly translucent yellow basally .... 3.

3. First visible abdominal tergite of male black across entire dorsal exposure and well over the sides; small species, not 5 mm. in length; hind femur with one or two bristles near base on posterovental surface.................. *conducens*, Walk.

First visible abdominal tergite of male entirely yellow, or with small central dark mark; larger species, over 5 mm. in length; hind femur with bristles on at least basal half of posteroventral surface .... *planiceps*, Wied.

Byomya tempestatum, Bezzi.

Localities, Ubombo, 25. iv. 1916, 2000 feet (*R. A. L. Brandon*); Mange, Sierra Leone, 31. viii. 1925, on cattle (*E. Hargreaves*).

Byomya conducens, Walker.

This species is undoubtedly the same as *pulla*, Bezzi, Oriental specimens in my possession agreeing perfectly with those I have from Africa and with Bezzi's type, which is in the United States National Museum collection.

Localities, Aburi, Gold Coast (*W.H. Patterson*); Bradford, Sierra Leone, 2. x. 1924 (*E. Hargreaves*); Umtali, S. Rhodesia, xi. 1927 (*A. Cuthbertson*).

Byomya planiceps, Wiedemann.

A specimen from Trincomali, Ceylon, has the third wing-vein setulose on almost its entire extent below, those from Java and India now before me differing in having the setulæ confined to the section of the vein proximad of the inner cross-vein.

It is possible, but hardly probable, that there are two species involved in the series before me, but more material is required to permit one to arrive at a decision as to the variability of the hairing of the third wing-vein.

Genus LISSASTERNA, Bezzi.

This genus was erected by Bezzi for the reception of *Musca albina*, Macquart, the character used as a basis for its distinction being the lack of sternopleural bristles.

Lissasterna albina, Macquart.

I have seen a number of specimens from Ceylon taken by Dr. Walther Horn which are in the collection of the Deutsches Entomologisches Institut in Berlin.

For characters, see comparison under the following species.

Lissasterna polita, sp. n.

Male.—Head black, orbits, face, and cheeks densely white-dusted. Thorax glossy black, with a slight bluish or greenish tinge, the dorsum in front centrally, and the humeral angles very slightly white-dusted, not densely so on humeri as in *albina*. Abdomen translucent reddish yellow, first tergite broadly black on disc, second with a median quadrate black mark which widens out anteriorly and connects with the mark on first tergite, third with a similar black mark which narrows anteriorly, fourth with most of its dorsal exposure black, third and fourth tergites with dense changeable silvery-white dust on centre which partly obscures the black markings. Legs black. Wings whitish hyaline. Halteres yellow. Calyptræ white.

Eyes long-haired; frons about as wide as third antennal segment; parafacial wider than third antennal segment; vibrissal angle slightly produced. Thoracic dorsum with quite dense and rather long erect dark surface-hairs, no presutural bristles in evidence except the posthumeral, only the posterior pair of dorsocentrals and intra-alars present; anterior sternopleural slightly developed; hypopleura with central hairs. Abdomen ovate. Fore tibia without a posterior median bristle; mid-tibia without a ventral median bristle; hind tibia with a regular series of closely-placed anterodorsal hairs on entire extent, no outstanding bristle present. Inner cross-vein at about two-fifths from apex of discal cell; first posterior cell open.

Length 6 mm.

Type, Farm Otjitueza, 66 km. N. Windhuk, South-west Africa, 13.v.1911 (*W. Michaelsen*); Hamburg State Zoological Museum.

A female which has a close resemblance to that of *albina*, even to the broad dorsal thoracic white-dusted vittæ, may belong here. It is from Okahandja, in same Colony.

The male of *albina* has the eyes bare or almost so, the posthumeral bristle absent, and the anterodorsal series of hairs on the hind tibia not so noticeably developed. The inner cross-vein of the wing is also closer to the middle of the discal cell.

Family Calliphoridæ.

Subfamily *CALLIPHORINÆ.*

In a previous part of this series of papers I presented a key to the African genera of this subfamily then known to me. In the recently received material I find some species which compel me to modify that section of the generic key where *Kenia*, Malloch, and *Tricyclea*, van der Wulp, are located. I realize the probabilities are that such modifications or revisions will have to be undertaken with the receipt of any considerable amount of material belonging to the subfamily, especially if the species are from localities in which little or no intensive collecting has been done, and I put forward the additional data herein contained merely as an extension of my previous attempt to elucidate the genera of the subfamily.

In the four genera treated next there is a character present which appears to link them to some extent with the subfamily Rhiniinæ, though it may be that its existence is due to a similar habit which has produced it rather than to a closer phylogenetic affinity with that subfamily than to the Calliphorinæ. I refer to the presence of a bare, shining, or glossy stripe round the external half of the upper occiput. This is very evident in all the genera except *Kenia*, but even in the latter it is readily distinguished, and in all Rhiniinæ it is readily seen.

In all of the genera of this group of four, as well as in *Cordylobia*, Roubaud, *Auchmeromyia*, Brauer & Bergenstamm, and one or two others, there are three pairs of well-developed presutural acrostichals, the posterior pair at, or very close to, the suture, and normally the lateral bristles on the lower edge of the scutellum are extended forward to, or almost to, the level of the strong sub-basal bristle on the latero-discal edge. In other genera the presutural acrostichals number one or two pairs in front of suture and the posterior pair is well separated from the sutural line, while the bristles on the lower edge of the scutellum cease well beyond the level of the sub-basal one on upper latero-discal edge.

Genus KENIA, Malloch.

I have received no fresh material in this genus, but one species now to hand has caused me to compare it more exhaustively with *Tricyclea* and this new addition, with the result that I have discovered other characters than those used in my key for their separation.

A noteworthy character of the genotype of *Kenia* lies in the armature of the hind tibia. In this the two dorsal series of short black setulæ are complete from base to apex, a character found in most Tachinidæ, while in *Tricyclea* the posterior, or inner, series is discontinued or but irregularly represented on the apical half. The sixth wing-vein in *Kenia* is complete, and the third vein is setulose at base below and to well beyond the inner cross-vein above. I figure the antenna and arista of *Kenia* (fig. 3, p. 107).

Genus KENIELLA, nov.

This genus is quite similar to *Kenia*, and appears to be a connecting-link with *Tricyclea*, but the weight of evidence appears to justify the three being kept separate.

The frons in both sexes is about one-third of the head-width and is similar in the male to that of *Kenia*, there being a forwardly directed supraorbital present in both sexes; the head in profile is as in fig. 4, the antennæ are shorter than in *Kenia*, and the arista is haired as in *Tricyclea*. Apart from the wide frons of the male, the genus is distinguished from *Tricyclea* by few outstanding characters. The female will run down to the segregate of the species of that genus containing *diffusa*, Malloch, and *palliventris*, Curran, from the former of which, and the two new species of *Tricyclea* hereinafter described, it is distinguished by the lobed lower calypter. I believe that the male of *palliventris* will be found to have a narrow frons, and the female is distinguished from the present species by the presence of a series of bristles across the disc of the fourth visible abdominal tergite.

Genotype, the following species.

Keniella somereni, sp. n.

Male and *female*.—Head testaceous-yellow, white-dusted on orbits, parafacials, and anterior half of cheeks; antennæ and palpi yellow; hairs on parafacials and cheeks black. Thorax testaceous-yellow, mesonotum broadly fuscous, only the lateral margins yellow, the dark portion with pale grey dust and slight indications of vittæ; scutellum yellow; a large dark mark on the pteropleura; postnotum fuscous. Abdomen concolorous with thorax, second and third visible tergites in both sexes with apical black fascia, extended forward in centre, the fourth tergite in male with indications of a centrally interrupted dark fascia; fifth sternite of male with yellow lobes. Legs yellow. Wings hyaline, with faint dark clouds as follows: between first and second veins beyond the furcation of latter with third vein, at apex of auxiliary vein, and over inner cross-vein, and in the male with a very faint clouding from apex of first vein to apex of second vein along costa. Calyptræ and halteres yellow.

Frons at vertex one-fourth of the head-width in male, a little less than one-third of the head-width in female, orbits narrow, triangle undeveloped; head in profile as fig. 4. Thorax with 2+4 pairs of dorsocentrals, 2+3 acrostichals, only four bristles on the presutural lateral area. Bristles on apices of abdominal tergites weak, none on disc of fourth; fifth sternite of male as fig. 5; hypopygium as figs. 6 and 7. Legs normal, the inner, or posterior, series of short black setulæ on hind tibia more nearly entire than usual, rather irregular beyond the second posterodorsal bristle, the bristling of hind tibia consisting of one anteroventral, two anterodorsal, and two posterodorsal bristles; the hind tibiæ of male are damaged, the left one is practically all missing, while the right one is slightly malformed and the strong median bristles are broadly lanceolate, and probably in this respect abnormal. Wing-venation normal for the group, third vein setulose on upper side to a little beyond inner cross-vein, setulose only at base below; preapical bend of fourth vein rounded; sixth vein not attaining margin of wing. Lower calypter lobed on inner side.

Length 6–7 mm.

Type, male, allotype, and one female paratype, Rabai, Kenya Colony, v. 1928 (*Dr. Van Someren*); British Museum.

Genus TRICYCLEA, van der Wulp.

Two new species received subsequent to sending my last paper of this series to the press are of interest in that they present a striking similarity in markings of the wings to those of *perpendicularis*, Villeneuve, while belonging to a different segregate of the genus. Both of the new species lack the outer posthumeral bristle, having but three or four bristles instead of five on the presutural sublateral area, and thus they run down to caption 9 in my key to the species included in the paper just mentioned.

In that segregate I had but two species previously available, one of these, *palliventris*, Curran, having the wings entirely hyaline and the lower calypter lobed on the inner margin, the other, *diffusa*, Malloch, having a broad diffuse costal cloud extending from between apices of auxiliary and first veins to beyond apex of second vein and connecting with a similar cloud over the inner cross-vein, and the lower calypter without a lobe on inner margin. In both of the species now under discussion there are two conspicuous black costal marks which are well separated, one between apices of auxiliary and first veins and the other on apex of second vein. This character distinguishes them from all the species known to me except *perpendicularis*, and from it both are distinguished by many characters other than the lack of the outer posthumeral bristle already mentioned, including the unlobed lower calypter, which latter character allies them with *diffusa*.

The two new species may be distinguished as below:—

A. Scutellum entirely yellow; frons of female black on the posterior third of orbits and the triangle, the interfrontalia orange above, becoming paler in front; stigmal spot small, not extending half of the distance from apex of first vein to apex of auxiliary; sides of mesonotum behind suture rather broadly yellow; hind legs entirely yellow .... *binotata*, sp. n.

AA. Scutellum broadly black at base; frons of female black on posterior, yellow on anterior, half; stigmal spot extending almost the entire distance between apices of first and auxiliary veins; mesonotum entirely dark behind suture; mid and hind femora blackened at apices, hind tibiæ and tarsi fuscous except at bases, the dark portions most distinct in the male .... *bifrons*, sp. n.

Tricyclea binotata, sp. n.

Male and *female*.—Head testaceous-yellow, frons in male black from in front of anterior ocellus to vertex, upper half of occiput black, with a glossy band as in the subfamily Rhiniinæ, lower central portion and postocular orbits pale grey dusted, frontal orbits anteriorly, and upper parafacials, white-dusted, almost silvery; in the female the upper third of each orbit and the ocellar triangle are black, and the interfrontalia is orange behind, becoming paler in front; antennæ and palpi yellow; aristæ and their hairs dark; parafacials with a few microscopic pale hairs, genal hairs black. Thorax testaceous-yellow, a little deeper-coloured than head, entire disc black between the intra-alar series of bristles, when seen from behind with slight white dusting and quite noticeably shining; scutellum yellow, postnotum and the small knob below base of wing black. Abdomen coloured as thorax, with an apical black fascia on each tergite from second visible to fourth, the first two prolonged forward in centre, the one on fourth tergite rather broadly interrupted in centre; lobes of fifth sternite of male black. Legs yellow. Wings hyaline, a dark brown spot over apex of first vein which does not extend over midway to apex of auxiliary vein, and touches second, an elongate dark brown spot on apex of second vein which extends along costa about midway to apex of first vein, but does not reach third vein on the field of wing, and a faint brownish cloud over inner cross-vein. Calyptræ pale brownish. Halteres yellow.

Frons of male almost linear above, orbits setulose on more than anterior half, ocellar bristles short and fine, outer verticals lacking, inner pair longer than ocellars; frons of female less than one-third of the head-width at vertex, slightly widened in front, all four verticals well developed, each orbit with a posterior recurved upper bristle, anterior to it one forwardly directed bristle, and in front of the latter about seven incurved bristles; antennæ normal; lower half of facial ridges with short black hairs; cheeks rather sparsely black-haired; palpi rather long, somewhat larger and wider in male than in female; eye-facets in male not exceptionally enlarged above. Thorax with four pairs of postsutural dorsocentral bristles. Lobes of fifth abdominal sternite in male broad, contiguous medianly, and rounded at apices, with sparse setulose surface-hairs. Anterodorsal setulæ on fore tibia very short; hind femora each with two or three bristles at base on posteroventral surface and two or three near apex on anteroventral surface; hind tibia with one anteroventral and two anterodorsal bristles, no evident posterodorsal bristles. Third wing-vein setulose to, or slightly beyond, inner cross-vein on upper side.

Length 5 mm.

Type, male, and allotype, Nairobi, vi. 1928 (*Dr. Van Someren*).

Tricyclea bifrons, sp. n.

Male and *female*.—A larger and darker species than the preceding one, the upper half of frons in female black, the thoracic dorsum behind the suture fuscous, with grey dust, only the lateral presutural margins and humeri yellow, and the scutellum black, with a broad yellow apical margin; pleura fuscous on most of central portions, not entirely yellow; abdomen marked as in *binotata*, but the black apical fasciæ are broader, usually extending to anterior margin in centre, and there is a centrally interrupted black fascia on first visible tergite that is not present in the preceding species. The apices of the mid and hind femora are more or less conspicuously blackened, and the hind tibiæ and tarsi are dark except at bases, while the mid-tarsi are dark apically. Stigmal and preapical costal spots black, larger than in the preceding species, the former filling almost the entire space between first and auxiliary veins.

Structurally the species are very similar, but the frons is narrower in the male than in *binotata*, and there are two or three outstanding short setulæ on the posterodorsal surface of the hind tibia that are not present in the other species.

Length 6–6·5 mm.

Type, male, allotype, one male and one female paratypes, Nairobi, Kenya Colony, vi. 1928; one female paratype, Karara Forest (*Dr. Van Someren*).

Tricyclea perpendicularis, Villeneuve.

I have received two additional specimens of this species, both females.

Localities, Njala, Sierra Leone (*E. Hargreaves*); Mombasa, iv. 1928 (*Dr. Van Someren*). British Museum.

Tricyclea pterostigma, Bezzi.

I have not seen this species, which was originally described as a *Zonochroa* from Aburi, Gold Coast, but the description is very similar to that of *unipuncta*, Curran—in fact, so similar, except that the costal spot is described as small, that it would appear to be the same species, or one that can be distinguished from it only by a careful comparison of the type-specimens.

I have already indicated, in a previous paper, my attitude towards the distinctions between *fasciata*, Macquart, and *unipuncta*, Curran.

Tricyclea semicinerea, Bezzi.

This species was originally described from a female taken in Eritrea and may belong to the same group as *palliventris*, Curran, or *evanida*, Villeneuve, but an examination of the type-specimen will be necessary to determine its specific identity.

The description agrees very well with *palliventris*, which according to records is quite widely distributed in Africa.

Genus HEMIGYMNOCHÆTA, Corti.

It is quite evident that another synonym of this genus is *Parochromyia*, Hough, 1898, and from the description of *varia*, Hough, the genotype, I infer that there were at least two species in the type-series, one of them, with dark spot on disc of scutellum, possibly *pallens*, Curran, and the other, without such a spot, *lutea*, Corti. Here again type-examination is essential to the elucidation of the species involved.

I have a number of specimens belonging to this genus from Nairobi, but pending a better understanding of the specific distinctions, which I hope to arrive at in a short time, I leave the material aside.

It is of interest to note the names applied to this genus. Ordinarily when an author uses a name to which he has prefixed another word indicates that he is intending to indicate some similarity, and if we assume that such was the case here it would indicate a rather striking diversity of opinion amongst those who named the genus, or a too limited knowledge of the group to permit of such a course.

Gymnochæta, Robineau-Desvoidy, is a genus of metallic green or blue Tachinids; *Auchmeromyia*, Brauer & von Bergenstamm, is the genus which contains the Congo Floor-maggot, and is not very closely related, nor even similar, except in colour, to this genus; *Ochromyia*, Macquart, is the same as *Bengalia*, Robineau-Desvoidy, and more nearly related to *Auchmeromyia* than to *Tricyclea*, of which the present genus is an offshoot apparently. Curran came nearest to the truth, if his name (*Tricyclodes*) indicates his idea of relationships, but it was the fourth proposed for the genus and cannot be retained.

Genus Bengalia, Robineau-Desvoidy.

Subgenus Ochromyia, Macquart.

Bengalia (*Ochromyia*) *depressa*, Walker.

One female, Salisbury, S. Rhodesia, River Makabusi, 15. ii. 1921 (*A. Cuthbertson*); Department of Agriculture of S. Rhodesia.

Bengalia (*Ochromyia*) *spurca*, Brauer & Bergenstamm.

One male, Njala, Sierra Leone, 21. ii. 1925 (*E. Hargreaves*).

Bengalia (*Ochromyia*) *spinifemorata*, Villeneuve.

Two males and one female, Salisbury, S. Rhodesia, 29. ii. 1912, 10. iii. 1927, and iv. 1928, the last two collected by A. Cuthbertson, and submitted by the Department of Agriculture of Southern Rhodesia.

Bengalia (*Bengalia*) *hastativentris*, Senior-White.

A female specimen in rather poor condition, from Trincomali Hot Wells, Ceylon, 16. viii. 1891 (*Col. J. W. Yerbury*); British Museum.

Genus HEMIPYRELLIA, Townsend.

Hemipyrellia curriei, Townsend.

I believe this species is the same as *setiventris*, Malloch, the latter name being therefore a synonym.

Four specimens, Nairobi, Kenya, iv. 1927 and 11. v. 1927 (*Symes & Hopkins*); three, Miriu River, Kenya, iii. 1925 (*C. B. Symes*); one, Salisbury, S. Rhodesia, 1927 (*H. S. Leeson*).

X.—*A Comparative Study of the Otoliths of the Neopterygian Fishes* (continued). By G. ALLAN FROST.

[Plates I. & II.]

XVIII. Order PERCOMORPHI (*concluded*).

Suborder MUGILIOIDEA.

The otoliths of the family Mugilidæ resemble generally those of the Serranidæ, and are noticeable for their fragility, curvature, and the constricted appearance of the middle part; the sulcus is upwardly inclined as in the otoliths of the family Trachinidæ.

In *Mugil capito* (Pl. I. fig. 1) the shape is elongate, highest anteriorly and constricted medianly. The dorsal rim has a median depression, the ventral rim is irregular and deeply indented, the posterior rim is irregular and inconstant in shape, the anterior rim has a rounded rostrum, and above is oblique. The sulcus opens on the anterior rim and has an angle of the upper margin; the ostium is horizontal and wide; the cauda is uniformly narrow, upwardly inclined, slightly curved, and the end is well removed from the posterior rim.

In *Mugil argenteus* (Pl. I. fig. 2) (South Australia) the otolith resembles that of *M. capito*, but differs slightly in the greater length and in the longer and more curved cauda, which ends near the posterior rim.

In *Mugil curema* and in *Mugil cephalus* the sagitta resembles that of *M. capito*, while that of *Agonostomus forsteri*, also belonging to this family, resembles very closely the more elongated otolith of *M. argenteus*.

The sagitta of *Sphyræna barracuda* (Pl. I. fig. 3), fam. Sphyrænidæ, is of the Percid type, and resembles that of *Perca fluviatilis*. It differs in the beak-shaped posterior projection, in the deep pointed excisura, in the indented ventral rim, and in the undistended cauda. In aged examples the otolith becomes thick and contorted.

In *Sphyræna guachancho* (Pl. I. fig. 4) the otolith is long and narrow in shape, the outer side is flat, and the inner side is convex. The dorsal rim is straight, the ventral rim is very slightly curved, the posterior rim is oblique with the lower part pointed, and the anterior rim consists of a prominent pointed rostrum, above which a slight excisura may be present. The sulcus opens widely on the anterior rim, and has a strong anterior angle of the lower margin; in some examples there is also an angle of the upper edge; the cauda is straight, of medium width, and contains a second angle of the lower margin; this is close to the pointed end, the upper margin of which is curved and the lower straight.

In *Atherina presbyter* (Pl. I. fig. 5), fam. Atherinidæ, the sagitta is deep, thick, and ovate, the outer side is flat and furrowed, and the inner side is convex and depressed above the sulcus. The dorsal rim is high and dentated, the ventral rim is deep and slightly serrated, the posterior rim consists of two pointed processes, between which is an indentation, and the anterior rim consists of a rostrum, antirostrum, and a small excisura. The sulcus opens on the anterior rim and has an angle of the lower margin; the cauda is straight, and, expanding in its posterior part, opens on the posterior rim between the processes.

Suborder STROMATEOIDEA.

The sagitta in *Centrolophus niger* (Pl. I. fig. 6), fam. Stromateidæ, is of the Percid type, and resembles that of *Perca* in its general appearance. It differs in the dorsal rim, which is highest in its posterior part, in the pronounced excisura, in the greater distension and curve of the cauda, and in the absence of a lower angle to the sulcus.

In *Seriolella brama* (Pl. I. fig. 7), of the same family, the otolith resembles that of *Centrolophus*. It differs in the dorsal rim, which is high anteriorly as in *Perca*, in the more curved ventral rim, and in the rounded antirostrum. The sulcus is without angles and resembles that of *Centrolophus* in the distended cauda.

In *Psenopsis anomala* (Pl. I. fig. 8), a Japanese species of the family Stromateidæ, the sagitta resembles that of *Atherina* of the suborder Mugiloidea; it differs, however, in the distended cauda, which resembles that of *Seriolella* and does not reach the small rounded posterior rim. It differs from the otoliths of *Centrolophus* and *Seriolella* in the downward distension of the ostium and in the presence of a strong lower angle to the sulcus.

Suborder BLENNIOIDEA.

Divided by Mr. Tate Regan into three divisions: Blenniiformes, Cliniformes, and Ophidiiformes. The otoliths of the species examined of the first and second divisions are invariably very minute in relation to the size of the fish. In most cases they resemble Labrid forms, but others have Clupeid features. In all the sulcus opens on the anterior rim. The otoliths of the third division, the Ophidiiformes, are, on the contrary, very large and are highly specialized; the sulcus is entirely enclosed, and in the family Brotulidæ and in *Genypterus* resembles the Scopelid type.

A comparison of the otoliths of *Ophidium* and *Fierasfer* confirms the placing of the Fierasferidæ in the division Ophidiiformes.

Division BLENNIIFORMES.

In *Blennius ocellaris* (Pl. I. fig. 9), fam. Blenniidæ, the sagitta is of the Labrid type. The shape is high and biconvex; the dorsal rim is high and rounded, passing into the upper part of the anterior rim; the ventral rim is regular and curved; the posterior rim is oblique; and the anterior rim contains a broad pointed rostrum and an excisura, above which it is rounded. The sulcus is divided by a strong lower median angle, which meets the descending dorsal area. The ostium opens on the rostrum, and the cauda is greatly distended and shallow, extending to the posterior rim.

In *Blennius pholis* (Pl. I. fig. 10) the sagitta is also of the Labrid type, but differs from that of *B. ocellaris* in the irregular dorsal area and rim, in the presence of a beaked antirostrum and large excisura, and in the slightly elevated wing-like lateral precess, extending from the antirostrum to the centre of the otolith. It also differs in the more forwardly placed lower angle of the sulcus. The cauda is spread and is less defined than in *B. ocellaris*.

In *Blennius sanguinolentus* (Pl. I. fig. 11) the sagitta resembles that of *B. ocellaris*, but differs in the lower height and in the re-curved ends of the ventral rim. It closely resembles the otoliths of the Labrids *Labrus mixtus* and *Lachnolaimus*.

The otolith of *Salarias vermiculatus* (Pl. I. fig. 12), fam. Blenniidæ, is of a different type to the foregoing and presents marked Clupeid features. The dorsal rim is low and regular, passing into the oblique posterior rim, the ventral rim is straight, and the anterior rim consists of a broad short rostrum. The sulcus is broad and opens widely on the anterior rim; an upper angle is present, but the lower line of the sulcus is straight, curving slightly to the end. The ostium opens widely on the anterior rim, and the cauda is distended and of the "bird's head" type already described in Clupeid otoliths (e. g., *Clupanodon* *).

The sagitta in *Anarrhichas lupus* (Pl. I. fig. 13), fam. Anarrhichadidæ, is small, thick, and rugged. The dorsal rim is high and domed, the posterior rim is irregularly perpendicular, the ventral rim is straight and serrated, and the anterior rim consists of a straight narrow rostrum, above which is a lateral wing-like process, resembling that in *Blennius pholis*, but stronger and more defined. The sulcus consists of a narrow ostium open on the upper part of the rostrum and terminated by a lower angle below the lateral wing. The posterior part of the otolith is umbonated, and the cauda is not distinct.

In the Arctic species *Anarrhichas latifrons* (Pl. I. fig. 14) the otolith in its general proportions resembles that of *A. lupus*, and the rostrum is equally prominent though differing in shape. The outer side is convex, the inner side is flat, and both are smooth. The dorsal rim is high and rounded, the ventral rim is curved, passing into the rounded posterior rim, the anterior rim consists of a curved beak-like rostrum, a small rounded antirostrum, and a rounded excisura. The sulcus is divided completely, the dorsal and ventral areas of the otolith meeting in the middle. The ostium lies upon the upper part of the rostrum, and the cauda is small and pip-shaped.

In the examples examined of *Congrogadus subducens*, fam. Congrogadidæ, careful investigation failed to find any evidence of otolithic bodies.

Division Cliniformes.

In *Labrisomus nuchipinnis* (Pl. I. fig. 15), fam. Clinidæ, the sagitta is of the Labrid type, and resembles very closely that of *Cheilinus fasciatus* of the family Labridæ. It differs slightly in the low dorsal rim, in the slight excisura and antirostrum, and in the wide shallow cauda, but the sulcus, with its median upper angle and the two lower angles, is similar in both species.

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* Ann. & Mag. Nat. Hist. ser. 9, vol. xv. pl. xi. fig. 9, Frost 1925.

In *Dactyloscopus tridigitatus*, fam. Dactyloscopidæ, the otoliths in the examples examined were absent or ultra-microscopic.

The sagitta of *Xiphidion mucosum* (Pl. I. fig. 16), fam. Xiphidiontidæ, in its outline resembles that of *Salarias* (Pl. I. fig. 12), but differs entirely in the sulcus, which, as in the Labrid type, has a large median lower angle and distended cauda. The dorsal and ventral rims are curved and meet posteriorly, the upper part of the anterior rim is rounded and the lower part consists of a short pointed rostrum. The sulcus opens on the anterior rim; the ostium is narrow and groove-like, and, curving upwards, it joins the large rounded cauda, which has a defined posterior margin some distance from the hinder rim of the otolith. This appears to be an intermediate form between that of *Salarias* and those of the Labrid type.

In *Dictyosoma burgeri* (Pl. I. fig. 17), fam. Stichæidæ, the otolith resembles that of *Salarias*. It differs in the presence of a small upturned antirostrum, in the wider opening of the sulcus, and in the posterior projection, which is level with the ventral rim.

In *Pholis gunnellus* (Pl. I. fig. 18), fam. Pholididæ, the sagitta is ovate and minute; the dorsal and ventral rims are curved and regular, the posterior rim is rounded, and the anterior rim consists of a rounded rostrum, a small rounded antirostrum, and a slight excisura.

The sulcus resembles that of *Blennius ocellaris* in the characteristic large lower median angle; the cauda is widely distended, and has a defined posterior margin as in that of *Xiphidion* (Pl. I. fig. 16), from which it differs in the wide ostium and in the narrow dorsal area of the otolith.

In the example examined of *Lumpenus lampetriformis*, fam. Lumpenidæ, the otoliths were absent or microscopic.

In *Zoarces viviparus* (Pl. I. fig. 19), fam. Zoarcidæ, the sagitta is narrow and flat. The dorsal rim is depressed posteriorly, the ventral rim is straight, the posterior rim is pointed, and the anterior rim consists of a pointed rostrum. The sulcus is divided as in *Anarrhichas latifrons* and the cauda is pip-shaped as in that species. The ostium is shallow and has an upper angle.

Division OPHIDIIFORMES.

In *Neobythites steatiticus* (Pl. I. fig. 20), fam. Brotulidæ, the sagitta is large and ovate in shape. The outer side is convex, and the inner side is flat. The dorsal rim is highest anteriorly, and is oblique in its posterior part; the ventral rim is deep and symmetrical; the posterior rim is small and blunt; and the anterior rim is oblique in its upper part, rounded below, and is without a rostrum, antirostrum, and excisura. The sulcus is enclosed and of the "Biovate" type, the upper margin is horizontal, and there is an angle of the lower edge. The ostium is ovate, well removed from the anterior rim of the otolith, and longer than the rounded cauda, which does not approach the posterior rim. Apart from the fact that the ostium does not open on the anterior rim, the form of the sulcus resembles the "Scopelid" type.

This form of otolith may be designated as the "Brotulid" type. It is frequent among fossil forms occurring in Tertiary formations, and has been described by Koken, Schubert, and other palæontologists, and usually has been referred to the Ophidiidæ.

The sagitta of *Sirembo gnathopus* (Pl. I. fig. 21), fam. Brotulidæ, is oblong in shape, and strongly resembles the Scopelid type. Both sides are nearly flat; the dorsal rim is low and slightly higher anteriorly, the ventral rim is straight, the posterior rim is rounded, and the anterior rim is oblique. The sulcus is horizontal as in *Neobythites*, and the sulcus is of the same type. It differs, however, in the extension of the ostium to the anterior rim of the otolith and in the rectangular shape of the cauda.

In *Ophidium barbatum* (Pl. I. fig. 22), fam. Ophidiidæ, the sagitta is very large, and resembles in shape that of *Neobythites*. It differs in the greater convexity of the inner side, and in the anterior rim, which, oblique in its upper part, is perpendicular below. The sulcus, which is entirely enclosed, is flush with the rest of the inner side and indicated only by grooved lines; the upper margin is straight, curving down over the cauda. The sulcus is ovate, enclosed, without an angle of the lower edge, divided longitudinally by a sigmoidal grooved line, and is rounded and lower at the caudal end.

Genypterus blacodes (Pl. I. fig. 23), fam. Ophidiidæ, has a large ovate sagitta, which is longer, thinner, and more curved than in the preceding species, while the anterior part of the dorsal rim is not elevated. The dorsal and ventral rims are curved, the posterior rim is small and slightly furcated, and the anterior rim is rounded; all the rims are serrated, and the posterior part of the otolith is narrower than the front part. The sulcus is enclosed and resembles that of *Neobythites*. The ostium is oblong and twice the length of the triangular cauda, from which it is divided by an angle of the lower margin.

The sagitta of *Fierasfer sanguinolentus* (Pl. I. fig. 24), fam. Fierasferidæ, is large and resembles that of *Ophidium*. It differs in the flat inner side, in the median elevation of the dorsal rim, in the slighter depth of the ventral rim, and in the more sharply pointed posterior rim. The sulcus is enclosed, ovate, and undivided, and resembles that of *Ophidium*.

The otoliths confirm the placing of *Fierasfer* in the division Ophidiiformes by Mr. Tate Regan. Fossil otoliths of *Fierasfer* are frequent in the Upper Eocene.

The otoliths of the division Ophidiiformes differ essentially from those of the divisions Blenniiformes and Cliniformes, not only in shape and in the different sulcus, but notably in their greater size relatively to the bulk of the fishes.

Suborder GOBIOIDEA.

The otoliths of the suborder Gobioidea are large in proportion to the size of the fish. The shape is usually oblong, with a domed dorsal rim, and in many cases the projection of the upper part of the posterior rim, combined with a similar extension of the lower part of the anterior rim, gives a rhomboidal appearance to the otolith. The sulcus is enclosed, and is separated from the anterior and posterior rims of the otolith by presulcal and postsulcal areas. The shape of the sulcus ranges from a simple ovate (e. g., *Eleotris fusca*) to the specialized form of that of *Gobius niger*, in which an angle of the lower line divides a wide truncated ostium from a smaller ovate cauda, giving rise to a type that may be described as "Gobiid." This form is unique and unmistakable, and has persisted since Eocene times, large numbers occurring in the Barton Clay of Hampshire, which closely resemble the otoliths of recent fishes.

In *Gobius niger* (Pl. II. fig. 1), fam. Gobiidæ, the sagitta is high, thick, and roughly rectangular with a rhomboidal inclination. Indentations of the anterior and posterior rims give a loaf-like shape to the outline. The outer side is convex and umbonated, and the inner side is flat near the rims, and raised round the sulcus. The dorsal rim is curved and crenulated; the ventral rim is straight; the posterior rim is indented, the upper part projecting; and the anterior rim also has an indentation, below which the lower part projects. The sulcus is entirely enclosed, and has a median angle of the lower line; the ostium is wide, depressed, and anteriorly truncated, the ventral part projecting; the cauda is narrower than the ostium, and is ovate and rounded at the end. The surface of the otolith is raised surrounding the sulcus, and below is a grooved depression. The type may be described as "Gobiid."

In *Aphia pellucida* (Pl. II. fig. 2), fam. Gobiidæ, the sagitta resembles that of *Gobius niger*. It differs in the presence of an indentation at the juncture of the posterior and ventral rims, and in the anterior rim, in which the upper part overhangs the lower part. The sulcus resembles that of *Gobius*.

In *Periophthalmus koelreuteri* (Pl. II. fig. 4), of the same family, the sagitta resembles that of *Gobius* in the sulcus. It differs in the greater height of the otolith, in the fine transparent texture, and in the curved shape. The outer side is concave, and the inner side is convex and delicately fluted; the dorsal rim is high and rounded, and the dorsal area is produced anteriorly and posteriorly, the sides of the ventral part being straight. The indentation of the posterior rim is rounded, and that of the anterior rim is wide and angular. The ventral rim is slightly irregular.

In *Eleotris fusca* (Pl. II. fig. 6), fam. Eleotridæ, the sagitta is ovate; the outer side is convex and the inner side is flat. The dorsal rim is domed and coarsely crenulated, the ventral rim is slightly curved, the posterior rim is rounded and indented, and the anterior rim is concave, with upper and lower projections. The sulcus is monovate, undivided, and occupies the middle of the inner side. This change from the usual Gobiid type of sulcus to an undivided monovate form is due to the absence of the usual angle of the lower margin, as can be seen by comparing it with the otolith of *Dormitator* of the family Eleotridæ, in which the sulcus represents a transition form between the two.

In the example examined of *Dormitator maculatus* (Pl. II. fig. 5), fam. Eleotridæ, the contour of the otolith has been altered by pathological conditions, probably caused by age. The shape resembles that of *Aphia* and the crystalline projections should be disregarded. The sulcus resembles that of *Gobius*, but differs in the rectangular lower angle, in the domed upper line, and in the rounded end of the ostium.

In *Eleotris sandvicensis* (Pl. II. fig. 3), fam. Eleotridæ, the sagitta is ovate and flat. The dorsal rim is domed, posteriorly there is a concavity, behind which is a raised rectangular process; the ventral rim is irregular, and passes into the pointed anterior rim, and behind forms a rounded angle with the perpendicular posterior rim. The sulcus is biovate, with a strong angle of the lower margin; the ostium is rounded, and is depressed below the level of the rounded cauda. The upper margin of the sulcus is curved and regular as in the monovate form seen in *Gobioides*.

The otolith of *Gobioides broussonetii* (Pl. II. fig. 7), fam. Gobiidæ, resembles that of *Eleotris fusca* of the family Eleotridæ. It differs in the regularity of the anterior and posterior rims, and in the presence of a domed ridge round the sulcus, similar to that in *E. sandvicensis*. The highly specialized Gobiid sulcus shown in the otolith of *Gobius niger* seems to have originated from a simple ovate form which still persists in *Gobioides* and *Eleotris fusca*; the presence of a lower median angle appears to induce a heightening of the upper line of the ostium which takes the form in *Gobius*, *Aphia*, and *Periophthalmus* of an upwardly extended dorsal angle. Transition forms are seen in the sulcus of *Dormitator* and *Eleotris sandvicensis*.

XVII. Order SYMBRANCHII.

Suborder Alabetoidea.

In the small Australian fishes *Alabes dorsalis* no otoliths were discernible.

Suborder Symbranchoidea.

In *Monopterus javanensis* (Pl. II. fig. 9), fam. Symbranchidæ, the sagitta resembles that of *Cepola rubescens* of the suborder Percoidea* in general shape and in the sulcus. It differs in the high dorsal rim, and in the depressed upper margin and narrow grooved opening of the ostium. The sulcus also resembles in its relative proportions those occurring in *Neobythites* and *Genypterus* of the division Ophiiformes (suborder Blennioidea). A rounded rostrum is present, but no antirostrum or excisura.

In *Symbranchus marmoratus* (Pl. II. fig. 8), fam. Symbranchidæ, the sagitta is ovate; the outer side is convex and furrowed, the inner side is slightly convex with furrows on the rims. The dorsal and ventral rims are curved and serrated; the posterior rim is rounded, while the anterior rim is pointed and without a rostrum or antirostrum. The sulcus consists of a shuttle-shaped horizontal cauda, and the ostium is represented by a fine narrow groove leading to the upper part of the anterior rim, the almost imperceptible opening being situated higher than the ostial groove in *Monopterus*.

In *Amphipnous cuchia* (Pl. II. fig. 10), fam. Amphipnoidea, the shape is elliptical and the otolith resembles that of *Symbranchus.* It differs in the broad and round-ended cauda, and in the shorter and broader ostial groove.

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* Ann. & Mag. Nat. Hist. ser. 9, vol. xx. pl. v. fig. 26.

SUMMARY.

In the suborder Mugiloidea the otoliths of the family Mugilidæ resemble generally the Serranid type; distinguishing features are the fragile structure, the curved shape, the constricted middle part, and the upwardly curved cauda. In the family Sphyrænidæ the otoliths are flat, and resemble the Percid type.

In *Atherina* (fam. Atherinidæ) the shape is high as in some of the Sparidæ, and the cauda opens on the anterior rim.

In the suborder Stromateoidea, the otiliths of *Centrolophus* and *Seriŏlella* resemble the Percid type, but differ in the absence of angles to the sulcus, whereas that of *Psenopsis*, in which the shape is high, resembles that of *Atherina* and has a lower angle of the sulcus. A distinguishing feature in all is the distended curved cauda, which does not reach the posterior rim.

In the suborder Blennioidea, the otoliths of the two first divisions—the Blenniiformes and the Cliniformes—are extremely small and in most cases resemble very closely those of Labrid fishes (e. g., *Blennius*, *Labrisomus*, etc.), others resemble Clupeid forms in which the "bird's head" cauda is present (e. g., *Salarias*, *Dictyosoma*): an intermediate form is found in *Xiphiodon* and *Pholis.*

In the third division, Ophidiiformes, the otoliths differ essentially from those of the two preceding divisions. They are very large relatively to the size of the fish, and give rise to a new type that may be described as "Brotulid"; this may be distinguished by the ovate shape, absence of rostrum, antirostrum, and excisura, and by the enclosed horizontal sulcus. The sulcus is divided and biovate in the Brotulidæ and in *Genypterus*, and resembles the Scopelid type in the cauda; in *Ophidium* and *Fierasfer* it is undivided, and has a faint longitudinal median groove.

Fossil forms resembling the otoliths of *Neobythites* and *Fierasfer* are numerous in the Upper Eocene of Barton, Hampshire.

The otoliths of the suborder Gobioidea are highly specialized and give rise to a type which may be described as "Gobiid," distinguished by the following features:—Shape oblong, sometimes with a rhomboidal inclination, no rostrum or antirostrum, and with parallel indentations on the anterior and posterior rims. Sulcus biovate, enclosed, divided by an angle of the lower margin, except in *Gobioides* and in *Eleotris fusca,* in which it is monovate and undivided.

In the otoliths of the order Symbranchii, a common feature is the narrow grooved opening of the sulcus on the upper part of the anterior rim. In *Symbranchus* and in *Amphipnous*, the groove represents the vestigial ostium and the remainder of the sulcus the caudal element.

In *Monopterus* the sagitta resembles that of the Percoid *Cepola rubescens*, the ostium is well developed, and the cauda is small and ovate, but the opening of the sulcus is small and groove-like as in the preceding species.

EXPLANATION OF THE PLATES.

PLATE I.

Order PERCOMORPHI (*cont.*).

Fig. 1. *Mugil capito*, × 1½.
Fig. 2. *Mugil argenteus*, 1½.
Fig. 3. *Sphyræna barracuda*, × 1⅛.
Fig. 4. *Sphyræna guachando*, × 1½.
Fig. 5. *Atherina presbyter*, × 2½.
Fig. 6. *Centrolophus niger*, × 2½.
Fig. 7. *Seriolella brama*, × 2½.
Fig. 8. *Psenopsis anomala*, × 1¼.
Fig. 9. *Blennius ocellaris*, × 6.
Fig. 10. *Blennius pholis*, × 6.
Fig. 11. *Blennius sanguinolentus*, × 5.
Fig. 12. *Salarias vermiculatus*, × 6.
Fig. 13. *Anarrhichas lupus*. × 3.
Fig. 14. *Anarrhichas latifrons*, × 3.
Fig. 15. *Labrisomus nuchipinnis*, × 4½.
Fig. 16. *Xiphidion mucosum*, × 8.
Fig. 17. *Dictyosoma burgeri*, × 6.
Fig. 18. *Pholis gunnellus*, × 7.
Fig. 19. *Zoarces viviparus*, × 4½.
Fig. 20. *Neobythites steatiticus*, × 2.
Fig. 21. *Sirembo gnathopus*, × 1¼.
Fig. 22. *Ophidium barbatum*, × 2.
Fig. 23. *Genypterus blacodes*, × 1.
Fig. 24. *Fierasfer sanguinolentus*, × 3.

PLATE II.

Fig. 1. *Gobius niger*, × 4.
Fig. 2. *Aphia pellucida*, × 3.
Fig. 3. *Eleotris sandvicensis*, × 3.
Fig. 4. *Periophthalmus koelreuteri*, × 2¼.
Fig. 5. *Dormitator maculatus*, × 2½.
Fig. 6. *Eleotris fusca*, × 4.
Fig. 7. *Gobioides broussonetii*, × 4.

Order SYMBRANCHII.

Fig. 8. *Symbranchus marmoratus*, × 3½.
Fig. 9. *Monopterus javanensis*, × 5.
Fig. 10. *Amphipnous cuchia*, × 3.

XI.—*The New Hebrides Fresh-water Sponge* Ephydatia fortis, *var.* hebridensis, *nov.* By N. GIST GEE, Rockefeller Foundation, Peking, China.

ON October 4th, 1928, the description of the new fresh-water sponge, which had been collected by Dr. John R. Baker on Gaua Island in June 1927, was mailed for publication*. Since that time we have been able to compare the spicules of this specimen more in detail with those of a rather large series of *Ephydatia* from various parts of the globe.

As a result of this study it has been concluded that the opinion which was expressed tentatively in the original description is correct, and that this New Hebrides sponge is a variety of the Philippine Island sponge *Ephydatia fortis*, and it is now given the name *Ephydatia fortis*, var. *hebridensis.*

In comparing our specimen (numbered 53797) of the New Hebrides sponge which we take as our type with a specimen of *Ephydatia fortis* kindly furnished us by Dr. W. Arndt, we note the following points of difference between the spicules of these two sponges:—

Skeleton spicules.

1. Those of *E. fortis* average somewhat longer and thicker than those of *E. fortis*, var. *hebridensis* :
   E. fortis: 280–380 mm. long, 11–20 mm. in diameter.
   E. fortis, var. *hebridensis*: 255–314 mm. long, 10–14 mm. in diameter.
   Some of the other New Hebrides specimens have somewhat larger and thicker skeleton spicules, which more nearly approach in dimensions those of the *E. fortis*; but as we have no gemmules with these we take the one indicated above with smaller spicules as our type.
2. The spines on the spicules of *E. fortis* are more numerous and larger than those in the New Hebrides variety.

Gemmule spicules.

1. The gemmule spicules of both are very variable in length and in spininess of shaft, but *E. fortis* averages more and heavier spines than *E. fortis hebridensis.* The spines on the shaft in *E. fortis* are

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* Ann. & Mag. Nat. Hist. ser. 10, vol. ii. p. 294.

large, sharp-pointed, and often bear minute spines upon them. Those of the New Hebrides variety are frequently blunt knobs with the very small spines arranged around their outer extremities.

2. The indentations in the rotules are alike very variable in the two forms.
3. Abnormal forms of gemmule spicules with the shafts projecting beyond the rotules at one or both ends of the spicule are common in both forms. These are usually longer than the normal ones.

We have also a Java specimen of *Ephydatia*, kindly sent us by Dr. Adriana G. Vorstmann, which we consider to belong to this group, and it will probably become a variety of the same species, though there are points of difference between it and the above forms which will have to be considered. We hope to treat this form soon in a second paper on the sponges of the Dutch East Indies.

We wish to express our thanks to Dr. Baker for the privilege of studying these interesting sponges.

XII.—*Descriptions and Records of Bees.*—CXVII.

By T. D. A. Cockerell, University of Colorado.

Habropoda sutepensis, sp. n.

♂.—Length about 10 mm.

Densely covered with long fulvous hair, very bright on abdomen and hind part of thorax above, sparingly mixed with black on dorsum of thorax, black hair on vertex, and a plentiful admixture of very long black hair at sides of face; on underside of head the hair is white, remarkably long and abundant, it is also white about bases of legs, and in middle of basal part of abdominal venter; clypeus creamy-white, with a dark spot on each side, and dark brown lower margin; labrum light ferruginous; mandibles largely cream-colour on outer side; space between clypeus and eyes creamy-white, with a very narrow upper extension along orbits; scape light in front; flagellum long, the joints marked with red beneath; tegulæ clear ferruginous. Wings brownish. Legs dark reddish, with mostly fulvous hair; hind femora with very long hair beneath, on the apical half black; hind tibiæ with a long fringe before and behind, the anterior fringe is double, with an inner fulvous part, and a longer outer part, which is all black except at base; the posterior fringe is rich fulvous, except the apical part, which is broadly black; hind basitarsi with a long black fringe behind. Tegument of abdomen dark, but hidden by the dense hair.

Siam: Doi Sutep, on summit, Feb. 9, 1928 (*Cockerell*).

Closely allied to *H. krishna*, Bingh., but smaller, with clypeus more truncate above, lateral face-marks extending to upper corners of clypeus, and abdomen without bands of black hairs at the bases of the tergites.

Callomelecta habropodæ, sp. n.

♂.—Length about 9·5 mm.

Head and thorax black, abdomen shining bright clear ferruginous, legs dusky red. Clypeus black, but densely covered with appressed pale hair; antennæ brown below, practically black above, scape large and stout; flagellum not very long, barely reaching tegulæ, apical joint curved; top of head, mesothorax, and scutellum polished; thorax with abundant long erect fulvous hair, not mixed with black; tegulæ ferruginous. Wings brownish; marginal cell going far beyond third cubital; basal nervure going a considerable distance basad of nervulus; second cubital cell greatly contracted above, bulging on outer side, receiving recurrent nervure about the beginning of its last third. Abdomen with short appressed pale fulvous tomentum on apices of second and following segments.

Siam: Doi Sutep, on summit, Feb. 9, 1928 (*Cockerell*).

It was flying with many *Habropoda sutepensis*, which it greatly resembles, and on which it is doubtless parasitic. The genus was based on a very different-looking species from the Malay Peninsula. An apparently related genus, with much longer antennæ, is *Protomelissa*, Friese. It contains two species, occurring in Formosa.

Nomia nanensis, sp. n.

♀.—Length about 8 mm.

Not very robust, the aspect that of an *Andrena*; head and thorax black, legs except basally red, abdomen mainly red; mandibles yellowish, subapically red, and apically black; face with very scanty thin pale hair, cheeks with short hair; clypeus convex, very densely punctured, supraclypeal area dull; flagellum stout, obscure brown beneath; tubercles reddish at end, and densely covered with yellowish-white tomentum; mesothorax dull, extremly densely and minutely punctured, very thinly covered with excessively short pale ochreous pile; scutellum hardly shining; postscutellum densely covered with pale ochreous tomentum; base of metathorax highly polished, the sculptured basal channel reduced almost to a line; mesopleura posteriorly shining; tegulæ clear fulvo-testaceous. Wings perceptibly dusky, greyish, stigma ferruginous; second cubital cell very small, receiving recurrent nervure toward the end. Legs mainly red, with pale hair, middle trochanters and bases of femora black; hind femora and tibiæ black or nearly so, except knees and basal part of tibiæ within; hind basitarsi broad. Abdomen highly polished, with thin erect white hair, but no bands; first segment clear ferruginous, second red, with a large black spot at each side basally, third more densely red, with much larger transverse lateral black marks, fourth black, with a very broad colourless margin, fifth dark, fourth and fifth with short fulvous hair; venter pale red basally, black apically.

SIAM: Nan, Jan. 7, 1928 (*W. P. Cockerell*).

Related to species of Indian *Nomia* which were placed by F. Smith and Cameron in *Andrena*—such, for instance, as *N. mollis* (Smith). Superficially, the aspect is exactly that of *Andrena comberiana*, Ckll.

Nomia siamensis, sp. n.

♂ (type).—Length a little over 7 mm.

Black, with very large pale red tegulæ, darkened at base; hind tibiæ with very large flattened white lobes, shaped like an axe-blade; hind tarsi white, with fulvous tomentum on inner side, the basitarsi with a large keel-like lateral extension, the apical joint black; middle tarsi white, with the apical joint broad-oval, black, their tibiæ anteriorly black at base, red in middle, and white at end; anterior tibiæ red apically and in front, their tarsi very short, basitarsus white, small joints reddish, last joint black. In nearly all respects like the common Indian *N. oxybeloides*, Smith, but differing by the fulvous-tinted hair of face; the fulvous hair on anterior part of mesonotum not extended, but sharply limited, with two points directed backward; posterior face of metathorax more densely punctured, the punctures in rows. Wings more dusky apically, stigma duskier and rather larger. Process of hind tibiæ larger and truncate (femora about the same in both); punctured part of first two tergites with a more evident transverse smooth band, that on second more or less curved downward in middle.

Abdominal bands less developed, decidedly fulvous-tinted, broad apical bands on segments 3 to 5, broadly interrupted on third.

♀.—Easily known from *N. oxybeloides* by the very distinctly punctured first two abdominal tergites; apical abdominal bands reduced to lateral patches, fourth segment with a very broad band of tomentum, fifth also with such a band; face less densely covered with white hair, which is only conspicuous at sides.

Siam: Csjun (type-locality), Jan. 28, 1928, 4 ♂, 1 ♀ (*Cockerell*); Nan, Dec. 27, at pale lilac flowers of a species of Compositæ, 2 ♀ (*Cockerell*).

A rather smaller and more slender form, with no very pronounced characters, is represented by a male, near paddy-field, Klong 11, Oct. 22, 1926 (Entom. Dept., Bangkok), and a female, Angkor, Cambodia, Feb. 20 (*W. P. Cockerell*).

This is also closely allied to *N. latispina*, Cam., from Allahabad, but that has the mesothorax thickly covered with scale-like fulvous hair.

Nomia strigata, var. *ridleyi*, Cockerell.

Siam: Klong Rang Sit, May 15, 1927 (Entom. Dept., Bangkok).

All the bees from the Entomological Department at Bangkok were handed to me by Major W. R. S. Ladell, and were presumably collected by him. The Klongs are the canals, presumably all in the vicinity of Bangkok.

Nomia oryzæ, sp. n.

♂.—Length about 10 mm.

Black, including mandibles, antennæ, and legs, but hind tibiæ clear ferruginous at the inner apical corner; eyes dark reddish brown, strongly converging below; tongue long and linear; clypeus and supraclypeal area with a median carina; face densely covered with dull white hair; antennæ ordinary, reaching to scutellum; mesothorax and scutellum entirely dull, the excessively minute sculpture not distinct under a lens; hair of thorax dull white, dorsally very scanty and slightly yellowish; a conspicuous pale band of tomentum across hind margin of mesothorax, and another covering postscutellum; base of metathorax with a simple transverse channel, not divided by ridges. Legs with pale hair; hind legs little modified, the femur slender and arched, its surface shining; the tibia also arched, trigonal, moderately broadened apically; the basitarsi with pale red hair on inner side; tegulæ small, pale testaceous. Wings hyaline, faintly reddish, the apex broadly pale greyish, but without any spot; stigma small, ferruginous; basal nervure meeting nervulus; second cubital cell nearly square, receiving recurrent nervure near beginning of last third. Abdomen dullish, very minutely rugoso-punctate, but the broad shining smooth hind margins of tergites pallid; no hair-bands; apex broadly truncate and subemarginate; fourth ventral segment dull, with a median line; underside of apical region very hairy.

Siam: near paddy-field, Klong 11, Oct. 22, 1926; from Major Ladell.

Related to *N. terminata*, Sm., *N. tuberculata*, Cam., and *N. fuscipennis*, Sm. From the first two it is easily known by the lack of a dark apical spot on anterior wings; from the third by the costal area not being fuscous. I examined Cameron's type of *N. tuberculata* in the Rothney collection at Oxford, and noted: dark cloud at apex of anterior wings; abdomen broad, shining black, not banded; tegulæ quite large, light ferruginous; extreme base of metathorax with a narrow shining transverse sulcus, and triangular area below it polished.

Nomia ladelli, sp. n.

♂.—Length about 7·5 mm.

Black, but mandibles reddish in middle, flagellum very obscurely red beneath, and ferruginous on legs, including more than apical half of anterior femora (except a stripe above, not reaching knees), their tibiæ and tarsi entirely, much of apical part of middle femora, and their tibiæ in front, the posterior knees also reddened, and tibiæ dark red on inner face, but hind tarsi practically black with pale hair. The hind legs are hardly modified, the femora stout, but not remarkable, the tibiæ short and thick, densely covered with white hair, the tarsi long and slender. Clypeus entirely dull, not carinate; front dull, but vertex shining; head and thorax with rather scanty red hair, slightly creamy on prothorax and tubercles, abundant and white on mesopleura, pale fulvous along hind border of mesothorax, where forming a broad band, white on postscutellum; mesothorax dull, very finely punctured; scutellum similar, the posterior middle with fulvous hair; basal part of metathorax shining, the basal channel very slender; tegulæ small, testaceous. Wings hyaline, stigma and nervures testaceous; basal nervure almost meeting intercubitus; second cubital cell small and narrow, receiving recurrent nervure about middle. Abdomen moderately shining, finely punctured, the depressed hind margins of segments somewhat reddish and covered by rather narrow white (greyish-white, not yellowish) hair-bands.

SIAM: Klong Rang Sit, July 6, 1926. From Major Ladell.

Near to *N. collina*, Cam., described from the female, but, considering the difference of locality, surely not its male. I examined the type of *N. collina* in the British Museum; it has the abdominal bands nearly all denuded. It is also closely related to *N. philippinensis*, Friese, from the Philippine Is., differing in the metathorax and the abdominal bands.

Nomia semiaurea, Cockerell.

Thursday Island, N. Australia, March 15, 1928, 3 ♀, 1 ♂ (*Cockerell*).

The male, not previously known, has a remarkable long black flagellum, the joints curved and producing a twisted effect, recalling *Agapostemon sicheli*, Vachal. All the tarsi are bright chestnut-red; the anterior and hind tibiæ red at apex. The hind legs are hardly modified, the hind femora stout and slightly clavate, shining; their tibiæ slightly reddish at base, and rapidly broadening to the apex, which is truncate. The male is more slender than the female, but otherwise very similar. The specimens were taken at the flowers of the cultivated *Antigonon leptopus*.

Nomia gilberti, Cockerell.

Thursday Island, March 15, 3 ♂ (*W. P. Cockerell*, *Alice Mackie*, *A. Foote*).

Nomioides feai, Vachal.

Nan, Siam, Jan. 21, 2 ♀ (*Cockerell*). New to Siam.

Nomioides nanensis, sp. n.

♂.—Length nearly 5 mm., anterior wing nearly 4.

Head and thorax green, the underside of the cheeks purple and lilac; clypeus, labrum, and mandibles bright lemon-yellow, the clypeus broader than long, the upper edge straight, the disc not spotted; supraclypeal area somewhat shining, but front dull, sides of vertex shining; scape yellow in front; third antennal joint very short, less than half length of fourth; flagellum very long, thick, black above and pale orange below; tubercles and upper border of prothorax yellow, but no other yellow on thorax; mesothorax shining olive-green, the surface microscopically tessellate; metathorax bluer green, the base dullish, microscopically transversely lineolate and partly reticulate, the rounded margin shining; tegulæ hyaline, base of wings yellow. Wings clear, nervures and stigma pale, the stigma with a dark margin; first recurrent nervure meeting second intercubitus; third cubital cell much contracted above; femora black, with yellow knees, the front pair submetallic behind; tibiæ and tarsi yellow, hind tibiæ with broad black band near apex. Abdomen broad; broadest beyond middle, shining black, second and third tergites each with a pair of transverse bright yellow marks; venter dark brown. The scutellum is very sparsely minutely punctured.

SIAM: Nan, on the bank of the Nan River, Jan. 13, 1928 (*Cockerell*).

The marking of the abdomen separates this from *N. incerta*, Blüthg., which Bingham doubtfully placed as the male of *N. feai*. It is so different from *N. feai* that it cannot be associated with it, and I can only regard it as a new species.

Tetralonia siamensis, sp. n.

♂.—Length 7 mm., anterior wing 5·2, antennæ about 6·5 mm.

Black, with the clypeus (except a dot at each side, and ferruginous lower margin) pale lemon-yellow, not evidently punctured; labrum white, with a tuft of pale hair; mandibles black, faintly reddened apically; scape very short, black; flagellum long, reaching to base of second tergite, black above, clear ferruginous beneath; hair of head and thorax long and white; facial quadrangle about square; eyes pale green; mesothorax closely and finely punctured, little shining; scutellum entirely dull; tegulæ piceous anteriorly and basally, but outwardly and posteriorly pallid. Wings hyaline, with very dark nervures; second cubital cell receiving recurrent nervure near its end. Legs black, with pale hair, tarsi red at apex; hind basitarsi with orange-tinted hair on each side. Abdomen short and broad, with white hair-bands at extreme bases of segments only; hind margins of segments reddened; a short spine on each side in apical region.

SIAM: Doi Sutep, Feb. 8, 1928 (*Alice Mackie*).

Known from similar small Indian species (as *T. erythrocera*, Cam., and *T. pitalomasa*, Dover) by the total absence of yellow on mandibles. It is much smaller than *T. vicina*, Mor., which has the mandibles black. The second tergite has only a slender band of white hair at the extreme base, instead of a very broad band as in *T. brevipennis*, Cam. The genus is new to Siam.

Trigona ambusta, Cockerell.

Kuala Lumpur, Federated Malay States, Feb. 1928 (*Cockerell*).

Described from Singapore.

Trigona aliceæ, sp. n.

Worker.—Length nearly 9 mm., anterior wing 9 mm.

Deep chestnut-red, the general effect dark, the face paler; polished and shining throughout; middle and hind tibiæ and tarsi black or almost, the middle tibiæ obscurely reddish; abdominal tergites with narrow black bands just before the broad dull hind margins; wings suffused with ferruginous, paler apically, stigma and nervures clear ferruginous, basal nervure going a little basad of nervulus; hair of head and thorax ferruginous, black just behind ocelli, middle and hind tibiæ and tarsi with much black hair. Mandibles with a broad rounded apical dusky cutting-edge; malar space black; upper and lateral sutures margining clypeus narrowly black; antennæ red; margins of prothorax and mesothorax, a band across scutellum anteriorly, and square patches on mesopleura posteriorly, black; metathorax strongly blackened except at sides, tegulæ red. Abdomen rather narrow, venter with black hairs.

Siam: On trail in jungle between Pahtoop Mountain and Nan, Jan. 9, 1928 (*Alice Mackie*).

Much like *T. flavistigma*, Cam., from Borneo, but mandibles different and middle tibiæ dark. Also near to *T. castanea* (Bingh.), but mesonotum not shaded with fuscous-black, thoracic hair not black, and abdomen not broader than thorax. Bingham's coloured figure shows an insect with much darker head and thorax, and much brighter red on the abdomen.

Trigona ferrea, sp. n.

Worker.—Length, and length of wing, each 8 mm.

Clear bright ferruginous, with ferruginous hair on head and thorax, fuscous just behind ocelli; mandibles red, with broad apical cutting-edge; antennæ red, black at extreme tip; surface throughout polished and shining; tegulæ red; wings suffused with red, paler apically, a dusky band just above the basal nervure; stigma and nervures clear ferruginous; middle and hind tibiæ and tarsi with black hair, the tarsi dusky red, and the middle tibiæ somewhat dusky. Abdomen short, not very broad, fourth segment blackened, with a red spot in middle and one at each side; vertex with dark hair.

Siam: Mekami River, Feb. 3, 1928 (*Cockerell*).

Related to *T. aliceæ*, but smaller and clear red. Also related to *T. lutea* (Bingh.), but separated by the clear red hair of thorax and lack of infuscation on mesothorax.

Trigona cambodiensis, Cockerell.

Described from specimens collected at Angkor, Cambodia, by Dr. H. M. Smith, whose account of the interesting nesting-habits was published. When we went to Angkor, Miss Alice Mackie was the first to find the nests (Feb. 18), and we had the pleasure of confirming Dr. Smith's observations on the spot. It was also collected in numbers at Nan, Siam, in December and January (*Cockerell, Alice Mackie*); while two are from Puang Creek, Siam, Jan. 26 (*Cockerell*).

Trigona hemileuca, sp. n.

Worker.—Length about 7 mm., anterior wing 7·6 mm.

Black, the whole body polished and shining; abdomen sometimes obscurely reddish apically, or hind margin of first tergite brown; trochanters red, tibiæ obscurely reddened; legs with coarse black hair; wings with basal half deep fuliginous, apical milky hyaline, stigma clear ferruginous. Looks exactly like *T. cambodiensis*, but appreciably larger, with the clypeus, and a subtriangular or rounded spot on each side of the upper part, more or less dusky but evidently red, and the tegulæ large and chestnut-red. The scape is red in front, and the flagellum dusky red beneath.

Siam: Nan (type-locality), Dec. 31 and Jan. 31 (*Cockerell*); Mekami River, Feb. 3 (*Cockerell*); Ban Maa Hia, Feb. 11 (*Alice Mackie*).

The face is conspicuously broader than in *T. fuscibasis*, Ckll.

Trigona melanoleuca, sp. n.

In appearance exactly like *T. hemileuca*, but differing thus: face entirely black, covered with a very fine pale pruinose pubescence; scape entirely black except the extreme base, which is reddened; tegulæ black; face not so broad. From *T. cambodiensis* it is known by the dark scape and the longer coarse black hairs on hind margin of hind tibiæ. The insect is polished as in *T. hemileuca.*

SIAM: Nan, Jan. 13, 1928 (*Alice Mackie*).

Ceratina siamensis nanensis, subsp. n.

♀ (type).—Length a little over 7 mm.

Deep blue, at most slightly greenish on face and anterior part of thorax; pale yellow clypeal mark with a delicate keel down the centre; yellow spots on tubercles very small. The stigma is very dark.

♂.—Yellow face-mark subtriangular, broad, its sides concave, its upper end obtusely pointed; blue colour and minute spots on tubercles as in female; anterior tibiæ with a pale yellow line in front, extending more than halfway down; hind tibiæ covered with white hair; apex of abdomen broadly rounded.

SIAM: Nan (type-locality), Dec. 30, 31, 2 ♀, 2 ♂ (*Cockerell*); Csjun, Jan. 28, 1 ♂ (*Cockerell*).

Typical *C. siamensis*, Ckll., is from Chiengmai; the form in the Nan valley appears to be subspecifically distinct, being smaller, blue, and with minute spots on tubercles.

Ceratina binghami, Cockerell.

Nan, Siam, Jan. 5 (*Cockerell*); Ban Maa Hia, Siam, Feb. 11 (*W. P. Cockerell*).

They are bluer green than is usual in Indian specimens, but the latter vary.

Mesotrichia confusa mckeani, subsp. n.

♀.—Occiput with much yellow hair; yellow of thorax extending downward to form a rounded patch on each side just below the wings; first intercubitus incomplete below.

SIAM: Chiengmai, May 1928 (*Dr. & Mrs. James W. McKean*).

Pérez had a similar, but not quite identical, form from Singapore, and justly remarked on its similarity to the Australian *M. bryorum* (Fabr.).

Halictus semicyaneus, nom. nov.

Halictus mesocyaneus, Ckll. Descr. and Rec. Bees, CXV. p. 356 (Samoa)—not Ckll. 1922.

The locality should be Rest House, not Red House.

XIII.—*Descriptions and Records of Bees.*—CXVIII.

By T. D. A. Cockerell, University of Colorado.

Osmia longicornis, Morawitz.

Tashkent, both sexes, March 25, 1926 (*N. Kuznetzov*).

Epimethea kuznetzovi, sp. n.

♂.—Length 5 mm.

Head broad, but not remarkably large; face creamy-white up to level of antennæ, and with thin white hair; lateral face-marks extending a very short distance upward; scape white in front; flagellum brown above, broadly orange-fulvous below; head above, mesothorax and scutellum black and highly polished; the only light marks on thorax (which are white) are two short lines on upper border of prothorax, spot on tubercles, and a transverse line on postscutellum; tegulæ pellucid brown, with a white spot. Wings milky hyaline, stigma extremely pale yellowish, nervures colourless; second cubital cell receiving both recurrent nervures; basal nervure a long way from nervulus; marginal cell narrowly truncate at end. Legs black at base, but the apices of the femora broadly, and the tibiæ entirely (without black marks) light yellow, the tarsi white, brownish apically; metathorax dull, contrasting with the shining mesothorax. Abdomen shining black, segments 2 to 6 with elongate creamy-white marks at sides, only slightly visible from above; sixth segment with a transverse pale line in middle; apical segment entirely pale yellowish; venter dark. Mandibles simple; tongue very short; maxillary palpi six-jointed, the joints subequal, but second longest; inner comb well developed; labial palpi four-jointed, the first longest (but not excessively so), the last slender; labrum simple, transverse, apically covered with fine hair; maxillary palpi exceeding galea, tip of galea with long hairs.

Kengrak, near Tashkent, Usbekistan, May 16, 1926 (*N. Kuznetzov*). Very many specimens taken.

Closely related to *E. lampronota*, Pérez, from Algeria, and perhaps no more than a subspecies, but constantly different in the markings.

This is certainly congeneric with our American *Spinoliella scitula* (Cresson) and *S. australior* (Ckll.), which must now be called *Epimethea scitula* and *E. australior*. It does not follow that the rest of our "*Spinoliella*" should go in *Epimethea*, for the genus as now understood is composite.

Thus *S. anthidius* (Fowler) has the maxillary palpi much shorter than the large galea, and the marginal cell is pointed at end instead of truncate. *S. zebrata* (Cress.) has the venation like *S. anthidius*. *S. comptula*, Ckll., has the maxillary palpi very long and slender, but not reaching end of galea; the marginal cell is of the *S. zebrata* type.

The mouth-parts of *Calliopsis* are quite different from those of *Epimethea*.

Bombus flavescens, Smith.

♂.—Darjeeling, India, at flowers of *Berberis*, Dec. 6 (*Cockerell*).

Friese queried whether this could be a colour variety of *B. pratorum*, but the flagellum is more slender and the third cubital cell is more elongate.

Bombus terrestris (L.).

Porirua, New Zealand, May 29, 1928 (*Alice Mackie*).

Bombus orientalis buccinatoris (Smith).

Darjeeling, Dec. 6, 1927 (*Cockerell*).

Anthophora zonata (L.).

Siam, from the following localities: male, Bangkok (*Ladell*); females, Bangkok (*Ladell*), Nan (*Mary Collier*), Chiengmai (*McKean*), Kum Puang Creek (*Cockerell*), Doi Sutep (*Cockerell*), Pah Meeung Mtn. (*W. P. Cockerell*).

The Kum Puang Creek one has the abdominal bands pale greenish; in the others it is bright blue.

Sphecodes turneri, Cockerell.

♀.—Nan, Siam, Jan. 13 (*Cockerell*).

There are eight hooks on the hind wing. With the compound microscope it is possible to see that the eyes have very sparse, excessively minute hairs. Described from Shillong.

Megachile disjuncta (Fabricius).

Chieng-mai, Siam, May 20 (*McKean*).

Megachile abluta, Cockerell.

♂.—Ban Maa Hia, Siam, Feb. 11 (*W. P. Cockerell*).

Described from Formosa. There is a slight difference in the mandibles, but I cannot separate the Siamese insect.

Megachile penangensis, Cockerell.

♂.—Ban Maa Hia, Siam, Feb. 11 (*Alice Mackie*).

Described from Penang, and also known from Koh Tao Island, Siam.

Megachile hera, Bingham.

♀.—Nan, Siam, Jan. 7 (*Cockerell*).

Described from Tenasserim.

Megachile gathela humida, subsp. n.

♀.—Larger (length 10 mm.).

Mesothorax and scutellum with brown hair, specially noticeable on scutellum. The sutures before and behind the scutellum have pale (cream-coloured) hair. The last abdominal sternite has black hair.

Nan, Siam, Jan. 30 (*Cockerell*).

It has been compared with typical *M. gathela*, Cam., from Deesa. The difference is just what would be expected as a result of the difference in climate. The dark (not ferruginous) tegulæ readily separate it from *M. ferozeporensis*, Cam.

Megachile philippinenis, Friese.

♀.—Klong Rangsit, Siam, Nov. 4, 1926 (*W. R. S. Ladell*).

The discovery of this Philippine species in Siam is surprising, but it is easy for these insects, owing to their nesting habits, to be distributed by shipping.

Megachile nematocera, sp. n.

♂ (type).—Length slightly over 6 mm.

Black, including antennæ and mandibles; anterior knees, anterior tibiæ (except an obscure spot near base), middle tibiæ (except a large black patch on posterior and outer sides), apex of hind tibiæ (extending halfway up on anterior side), and middle and hind tarsi, all bright ferruginous; anterior tarsi with the first three joints greatly broadened, cream-colour, the second and third with black spots on the inner face; small joints pale, slightly reddish; anterior coxæ hairy in front, not spined. Pubescence white, dense and shining white on face, forming a sort of elevated crest between and above antennæ; scape short, flagellum very long and thread-like; eyes pale green, blackish in front; vertex densely and finely punctured; mesothorax and scutellum shining, finely and rather closely punctured, with thin, short pale hair; hair of thorax dense and pure white on underside; tegulæ piceous, varying to rufescent. Wings hyaline, faintly clouded at apex, stigma and nervures dark; basal nervure falling short of nervulus. Abdomen parallel-sided, with creamy-white hair-bands, on first tergite developed only at sides; keel of sixth segment broad, entire, but the white pubescence beneath is angulate in the middle; venter white-tomentose.

♀.—Length 7·3 mm.

Black, including mandibles, antennæ, and legs. Mandibles short and broad; clypeus dull, minutely rugulose, the lower margin arcuate and shining; supraclypeal area shining but well punctured; sides of face with dense pure white hair; eyes light reddish brown; vertex very densely and minutely punctured; mesothorax and scutellum shining, with rather dense small punctures and very thin short pale hair; a very slender hair-line in scutello-mesothoracic suture; hind basitarsi with clear orange-fulvous hair on inner side; spurs pale reddish. Abdomen with five slender entire white hair-bands; last tergite descending, strongly concave in lateral profile; ventral scopa pure white, short and black on last segment.

Siam. Two males from Ban Maa Hia, Feb. 11 (*W. P. Cockerell*). Female from near Weing Sa, Feb. 1 (*Cockerell*).

A small species looking rather like a *Heriades*, but without pulvilli. It is closely allied to the Philippine Island *M. tarsalula*, Ckll., but easily separated by the legs of the male.

Anthidiellum melanaspis, sp. n.

♂.—Length hardly 5 mm.

Black, with bright lemon-yellow markings, as follows: mandibles, clypeus, broad supraclypeal region deeply incised in middle above, lateral face-marks ending about level of antennæ and filling space between orbits and clypeus and supraclypeal area, tubercles, large spots at sides of first tergite, broad bands on tergites 3 to 6, pointed laterally, rather narrowly interrupted in middle on 3, entire on the others; apical tergite also yellow; head and thorax very densely punctured; a small yellow spot on middle of front; flagellum obscure brown beneath; tegulæ large, black; scutellum wholly black, sharp-edged and strongly projecting, but not angular at sides; a tuft of white hair behind wings. Wings dusky, darker apically; basal nervure meeting nervulus; second recurrent going well beyond end of second cubital cell. Legs mainly black, but anterior tibiæ in front, and all the tarsi, pale reddish suffused with cream-colour, legs with fine white hair. Venter of abdomen largely pallid.

Thursday Island, March 15, 1928 (*Cockerell*).

Easily known from *Anthidiellum turneri* (*Anthidium turneri*, Friese) by the black tegulæ and scutellum, and by the black scutellum and other features from *Anthidiellum minutissimum* (*Anthidium minutissimum*, Bingham). I have previously referred the two species cited to *Dianthidium*, but that was when *Anthidiellum* was not treated as a genus. *Anthidiellum biroi* (*Anthidium biroi*, Friese), from New Guinea, is only known in the female; it differs by the entirely black first tergite, black mandibles, and other characters, and is not, I think, the female of *A. melanaspis*.

Megachila phaola, Cameron.

In 1919 I transferred this to *Heriades*, on advice I had received. This was followed by Dover in 1925. But I have now examined the type in the British Museum, and it is a small *Megachile*, without pulvilli. Male; size of *Heriades parvula* (Cam.); face covered with white hair; antennæ very long and slender. Wings clear. Legs and base of abdomen red.

Heriades laosella, sp. n.

♀ (type).—Length about 5·5 mm.

Black, without any red; ventral scopa white; eyes pale pea-green. Mandibles broad, densely striate-punctate, bidentate; clypeus with strong confluent punctures, running into grooves, sides of face with conspicuous pure white hair; cheeks with white hair; margins of mesothorax narrowly, and tubercles, with conspicuous white hair; mesothorax and scutellum strongly and closely punctured, the scutellum more shining; area of metathorax triangular, highly polished, with a row of pits at extreme base; tegulæ practically black. Wings clear, faintly dusky apically; basal nervure meeting the oblique nervulus. Spurs pale reddish. Abdomen shining, strongly but quite closely punctured, the segments beyond the third greyish from fine pubescence; margins of segments with very narrow white fringes, failing in middle of first, and only well developed on second.

♂.—Length about 5·5 mm.

Eyes green. Differing only in the usual sexual characters; flagellum long and slender, black; abdominal venter simple, its apical half pale reddish.

Nan, Siam, Jan. 4 (*Cockerell*).

The male has the punctures on the first two tergites finer than in *H. sauteri*, Ckll., from Formosa. The mesothorax is more robust, with coarser punctures than in *H. mundulus*, Ckll., from Palawan. Among the Indian species it falls nearest to *H. striolata* (Cam.), from Simla, in a totally different environment.

H. parvula, Bingham, and *H. parvula* (Cam.) were both published in 1897. Dover renamed Bingham's species *H. binghami*. Bingham, in his description of *H. parvula*, refers to a fine transversely-impressed line on the second tergite, which suggests that he had a small *Megachile*.

Nomada sutepensis, sp. n.

♂.—Length about 6 mm.; anterior wing 6 mm.

Black, with very scanty hair; eyes dark brown; face rather broad, orbits converging below. Mandibles simple, the base occupied by a very large reddish-orange spot; a transverse mark of the same colour just below eye, and a small subcuneiform mark at each lower corner of face, as well as a small dot above eye, but head otherwise all black; clypeus prominent, very densely punctured; antennæ very long but fairly stout; scape shining black, reddish at extreme apex; third joint a little shorter than fourth, and with a conspicuous orange-fulvous spot in front; flagellum reddish brown beneath; mesothorax entirely black, dull and granular; scutellum, postscutellum except at sides, tubercles, and two marks on upper border of prothorax, all orange-fulvous; metathorax dull and entirely black; lower end of mesopleura with a tuft of white hair; tegulæ bright rufo-fulvous. Wings clouded with brownish, nervures and stigma very dark; apex of wing and apical part of marginal cell fuscous; basal nervure going a little basad of nervulus; third cubital cell very broad, but narrowed almost to a point above, receiving second recurrent nervure beyond middle. Legs shining black, with anterior femora and tibiæ ferruginous in front, and their tarsi rufescent. Abdomen broad, with narrow base; shining black, first two segments smooth, third and fourth very minutely punctured; first tergite unmarked, second with a large orange-fulvous spot on each side (looked at from above, these spots appear marginal); third and fourth unspotted, fifth with two rather small spots, sixth nearly all orange-fulvous; apical plate broad, deeply notched; venter black except at apex.

Doi Sutep, Siam, Feb. 9, 1928 (*Alice Mackie*).

Allied to *N. polyodonta*, Ckll., from Penang, but easily distinguished by the black pleura and clypeus.

Momada picticauda, sp. n.

♂.—Length not quite 6 mm.

Black, with very scanty white hair; face very broad; eyes dark green. Mandibles simple, yellow at base, red in middle, dark at apex; band along lower half of posterior orbits, labrum, lower half of clypeus, and lateral face-marks all deep yellow; lateral marks very broad below, filling the wide space between clypeus and eye, but then rapidly narrowing, ending in a sharp point on orbit just below level of antennæ; yellow marks above top of eyes; clypeus broad, shining, the whole face glistening, as also the vertex; antennæ long; scape rather slender, curved, ferruginous in front; third joint slender, much longer than fourth; flagellum ferruginous beneath; scutellum (not evidently bigibbous) and postscutellum orange; tubercles mainly yellow, and two yellowish spots on upper border of prothorax; mesothorax shining but well punctured; mesopleura with a very broad transverse ferruginous band; sides of metathorax posteriorly hairy, and with two large white spots; tegulæ yellowish ferruginous. Wings dark fuscous at apex, and in apical part of marginal cell; stigma dull reddish, nervures piceous; basal nervure going well basad of nervulus; second intercubitus incomplete below on both sides; third cubital cell very narrow. Legs ferruginous, hind tibiæ largely blackish behind, middle femora black beneath except apically, their tibiæ black behind except extreme apex; hind femora black at base and beneath, their tibiæ nearly all black, but apex pale yellowish; hind tarsi darkened. Abdomen very broad, with narrow base, shining black, a red spot on petiole above; second tergite with two very large orange patches, twice as wide as the space between them; third and following segments with broad bands (narrowly interrupted on third), which are red basally and yellow apically; apical plate strongly notched; venter dark brown, with a yellow apical spot, and a reddish spot on first sternite.

Nan, Siam, Jan. 13, 1928 (*Cockerell*).

In the various tables this runs near *N. decorata*, Sm., which is a larger, quite different species, and *N. mindanaonis*, Ckll., which has a ferruginous thorax. There is some resemblance to *N. anpingensis*, Str., from Formosa, but the species is a very distinct one.

Nomada attenuata, sp. n.

♂.—Length slightly over 4 mm.

Very slender, with narrow abdomen; head and thorax black; face broad, with thin white hair, more dense on apical part of clypeus. Mandibles simple, yellow, with dark apex; labrum, lower half of clypeus (upper half reddish in middle and black at sides), lower corners of face (not extending upward), and small marks above top of eyes, all yellow; antennæ long, scape not swollen, yellowish red in front; third joint a little longer than fourth; flagellum clear ferruginous beneath; thorax small, not as wide as head; mesothorax dull; scutellum and postscutellum (except at sides) reddish orange; tubercles and entire band on upper border of prothorax orange; mesopleura with a dull reddish spot; metathorax with a pair of minute yellow dots and two patches of shining white hair; tegulæ rufofulvous. Wings with a dusky apical cloud, stigma and nervures dark; basal nervure going well basad of nervulus; third cubital cell broad below. Anterior and middle legs pale reddish in front, but their femora and tibiæ mainly dark behind; hind femora and tibiæ black, with knees and apex of tibiæ reddish yellow; hind basitarsi dark. Abdomen shining very dark brown; second segment with a large round yellow spot on each side, third with much smaller spots; third and following tergites reddish apically, the apex reddish yellow; venter dusky reddish.

Nan, Siam, Jan. 13, 1928 (*Alice Mackie*).

A peculiar little species, known by its slender form. I do not find any near relative, though we are reminded a little of the European *N. flavoguttata* (Kirby).

Allodape puangensis, sp. n.

♀.—Length about 4·7 mm., anterior wing about 3·5 mm. Black, with pale yellow face-mark and tubercles; legs black, but tarsi bright ferruginous apically; wings brownish, stigma hyaline in centre, with a heavy piceous margin; nervures fuscous, first recurrent nervure going a little beyond first intercubitus; abdomen shining, the segments without pallid margins. The hair on the legs is not pure white, but very slightly reddened. Antennæ black; mandibles black, with reddened apex; tegulæ dark reddish. The face-mark is peculiar, being cuneate, with the point downward, the broad basal part short, and with a little downward-pointed lobe or projection at each side.

Kum Puang Creek, Siam, Jan. 26, 1928 (*Cockerell*).

Allied to *A. cupulifera*, but known by the face-mark and very small size.

Allodape sauteriella, Cockerell.

♀.—Nan, Siam, Dec. 30 and Jan. 27 (*Cockerell*).
Described from Formosa.

Allodape cupulifera, Vachal.

♀.—Nan, Siam, Jan. 3, 5, and 14 (*Cockerell*).

Allodape mixta, Smith.

♀.—Nan, Siam, Jan. 8 (*Cockerell*).
The stigma is clear light ferruginous.

Ceratina (*Ceratinidia*) *lepida*, var., *sublepida*, var. nov.

♀.—Length about 8 mm.

Upper border of prothorax with a widely interrupted yellow band; tubercles entirely black; mesothorax without yellow markings; scutellum with an orange mark incised anteriorly, resembling a bird in flight.

Doi Sutep, Siam, at top of mountain, Feb. 10, 1928 (*W. P. Cockerell*).

Ceratina lepida, var., *sutepensis*, var. nov.

♀.—Like the last, but prothorax and scutellum entirely black. The yellow of legs is confined to a stripe on anterior tibiæ.

Doi Sutep, Siam, Feb. 8 (*Cockerell*).

These *C. lepida* forms are in the Siamese fauna by reason of the very short upward lobe of the clypeal band, only to be compared with *C. accusator*, Ckll., which is smaller and has the yellow on scutellum semilunar, rounded behind.

Ceratina (*Ceratinidia*) *accusator*, Cockerell.

Nan, Siam, Jan. 5 and 14 (*Cockerell*).
Described from Penang.

Ceratina (*Ceratinidia*) *incerta*, Cockerell.

Nan, Siam, Jan. 22 and 24 (*Cockerell*); Pah Meeung Mtn., Siam, Jan. 18 (*Alice Mackie*).

Described from Singapore and Penang. In the Siamese fauna falling next to *C. laosorum*, Ckll., but distinguished by the yellow lines on mesothorax and middle and hind tibiæ wholly black.

Ceratina (*Ceratinidia*) *philippinensis*, Ashmead.

♀.—West of Weing Sa, Siam, Feb. 1 (*Cockerell*).

I refer this to a Philippine I. species because I cannot see any material difference, but it may represent an independent parallel development from the *C. hieroglyphica* stock. In that case the male, when found, will probably show some distinctive characters.

Ceratina (*Ceratinidia*) *laosorum*, sp. n.

♀.—Length about 6 mm.

Black, with bright yellow markings, consisting of apical clypeal band, with very broad upward extension, which is notched at end, long entire lateral face-marks ending distinctly above level of antennæ, transverse supraclypeal band, two spots on front, stripe on upper part of cheeks, upper border of prothorax and tubercles, these narrowly connecting (no spot behind tubercles), scutellum, knees broadly, outer side of all tibiæ (anterior tibiæ rufous on inner side), broken transverse mark on first tergite, and the usual apical bands on next four tergites, enlarged laterally on the first three, and greatly enlarged in middle on fourth. Abdomen beyond the fifth tergite all black. Tarsi reddish, the hind ones darker; labrum and mandibles black; scape slender, black; flagellum obscurely brownish beneath; mesothorax without yellow lines, rather closely punctured between parapsidal grooves and tegulæ, but with a smooth band toward tegulæ; tegulæ small and rufous, a yellow spot at base of wing. Wings strongly reddened, stigma and nervures dusky ferruginous; basal nervure meeting nervulus; hind tibiæ with long white hair.

Nan, Siam, Jan. 5 (*Cockerell*).

In the Siamese fauna known by the large and broad median mark on clypeus, black mesothorax (without yellow lines), and tibiæ yellow on outer side. There is a rather close resemblance to the Philippine *C. nigrolateralis*, Ckll. It is named after the Laos people, living where it is found.

Ceratina (*Ceratinidia*) *corbetti*, sp. n.

♀ (type).—Length about 7·4 mm.

Black, with yellow markings (pale on head and thorax, rather brighter on abdomen) as follows: transvere apical band on clypeus with very large and broad upward extension (rounded, not notched), entire lateral marks extending a short distance above level of antennæ, transverse supraclypeal band, pair of frontal spots, long stripes on cheeks, continuous band on upper border of prothorax, tubercles (not continuous with band), four short stripes on mesothorax, large semilunar area on scutellum, stripe on anterior femora running from apex more than halfway down lower side, anterior tibiæ in front, small spot at base of middle and hind tibiæ, three spots on first abdominal tergite, the usual apical bands on tergites two to five, broadly interrupted on third and narrowly on fourth; apex entirely black, with long pale hairs; scape black, flagellum obscurely brownish beneath; tegulæ practically black; base of wings with a yellow spot. Wings pale brownish, stigma and nervures piceous, basal nervure falling short of nervulus; hind tibiæ with long silky white hair. Among the species of Siam and the Malay Peninsula known by the coloration of the legs, combined with the markings of mesothorax and clypeus. Among the described females it falls nearest to *C. incerta*, Ckll.

♂.—Length about 6·5 m.m.

Labrum with a yellow spot; middle tibiæ yellow on outer side, and hind ones more or less; sixth tergite with a large yellow mark; scutellar mark orange (yellow in *C. accusator*). The face is narrower than in the female, with much less space between the clypeal yellow and the lateral marks. There is no yellow spot behind the tubercles. This male falls nearest to *C. collusor*, Ckll., from Singapore, differing thus: yellow spot on labrum much smaller, scape all black, long stripe on cheeks, orange area on scutellum broadly triangular or subtriangular, first abdominal tergite with only a small or evanescent mark, band on second very widely interrupted, almost confined to the lateral spots, band on third widely interrupted, and on fourth narrowly interrupted.

Kuala Lumpur, F.M.S., Feb. 1928, 1 ♀, 2 ♂ (*Cockerell*).

Named after Mr. G. H. Corbett, of Kuala Lumpur, well known for his entomological writings. I was astonished to find a new species of *Ceratinidia* at Kuala Lumpur, having already described a number of species from the Malay Peninsula.

Ceratina dentipes, Friese.

♀.—Nan, Siam, Jan. 30 (*Cockerell*).

Previously known from Java and the Philippine Islands, but allied to *C. bispinosa*, Handl., from Syria. It may have been spread by commerce.

Ceratina lævifrons, Morawitz.

♂ ♀.—Ak-Tasch, 50 kilom. from Tashkent, Usbekistan, June 15 and 22 (*N. Kuznetzov*).

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XIV.—*A Preliminary Revision of the Berycoid Fishes of the Genus* Melamphaës. By J. R. Norman.

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In the course of my work on the oceanic fishes collected in the South Atlantic by the 'Discovery' Expedition, I have experienced some difficulty in determining the correct names for the fishes of the genus *Melamphaës*, and have been led to undertake a revision of this interesting group. The genus was previously represented in the British Museum collection by eight specimens belonging to six species, nearly all of which were collected by the 'Challenger' Expedition; the 'Discovery' material comprises about 100 specimens, referable to about nine species, and, in addition, I have been able to examine examples of several more species preserved in other institutions.

I take this opportunity of offering my thanks to the authorities of the Smithsonian Institution (United States National Museum) for the loan of authenticated specimens of *M. beanii*, Günther, *M. suborbitalis*, Gill, *M. lugubris*, Gilbert, and *M. cristiceps*, Gilbert; to Professor L. Roule, of the Paris Museum, for the loan of the type of *M. cocles*, Vaillant; and to Dr. L. F. de Beaufort, of the Zoological Museum, Amsterdam, for the type of *M. malayanus*, Weber. Finally, my thanks are due to Dr. S. Kemp and the members of the 'Discovery' Committee for entrusting me with the investigation of the oceanic fishes and for permission to publish this preliminary revision. I am also indebted to Mr. C. Tate Regan, F.R.S., for much help and advice during the progress of the work.

Following the description of each species, I give a list of the specimens studied, together with the locality, depth in metres, and the name of the vessel by which they were collected. The measurements given in brackets represent the total length from the tip of the snout to the end of the caudal rays.

MELAMPHAËS.

Metopias (non Gory, 1832), Lowe, Proc. Zool. Soc. xi. 1843, p. 89.
Melamphaës, Günther, Cat. Fish. v. p. 433 (1864); Deep-Sea Fishes 'Challenger,' p. 26 (1887).
Plectromus, Gill, Proc. U.S. Nat. Mus. vi. 1883, p. 257 (1884).
Scopelogadus, Vaillant, 'Travailleur' et 'Talisman,' Poissons, p. 141 (1888).
Lophocephalus, Osorio, J. Sci. Math. Phys. Nat. Lisbonne, (2) vii. no. 27, 1906, p. 173; Mem. Mus. Bocage, i, 1909, p. 8.
Scopeloberyx, Zugmayer, Bull. Inst. Ocean. Monaco, 193, 1911, p. 8; Rés. Cam. Sci. Monaco, xxxv. 1911, p. 103.
? *Poromitrella*, Zugmayer, *t. c.* p. 7; *t. c.* p. 100.

Head large, thick, the superficial bones modified by the presence of large mucous cavities. Cleft of the mouth of moderate width, oblique, with the jaws nearly equal in front; teeth small, villiform, arranged in one or two series or in narrow bands; palate toothless. Scales of moderate size or very large, somewhat irregularly arranged; no lateral line. A single dorsal, with two or three slender graduated spines and 9 to 18 soft rays. Anal with one or two spines and 7 to 10 rays; origin below or behind dorsal. Pelvics thoracic, formed of a slender spine and 7 soft rays. Caudal forked, the procurrent rays spinous; of 19 principal rays, 17 of which are branched.

Fourteen species.

Poromitrella nigriceps, Zugmayer, appears to be very closely related to certain species of *Melamphaës*, but is said to differ in the form of the dorsal fin, which is divided into two distinct portions, the anterior consisting of 12 spines, the posterior of 5 rays. This condition is perhaps abnormal, and the species may prove to be identical with *M. atlanticus* or *M. nigrofulvus*.

Malacosarcus, Günther, with a single species *M. macrostoma* from the Indo-Pacific, has been frequently associated with *Melamphaës*, but is readily distinguished by the form of the pelvic fins, which are without spines, 5- or 6-rayed, and subabdominal in position. Regan* places this genus with *Stephanoberyx* in a distinct family, the Stephanoberycidæ.

Poromitra, Goode & Bean, with a single species from the North Atlantic, may be placed in the family Melamphaidæ, which also includes *Anoplogaster*, Günther, and *Caulolepis*, Gill.

Synopsis of the Species.

I. More than 20 scales in a longitudinal series.
  A. No spine on the snout between the nostrils; origin of anal below last two or three rays of dorsal or further back.
    1. Dorsal with 17 to 20 (II or III 14–17) rays.
      a. Teeth in bands in both jaws; 8 or 9 gill-rakers on lower part of anterior arch; origin of anal well behind last ray of dorsal .... 1. *typhlops.*
      b. Teeth in two or three irregular series in both jaws; 15 to 17 gill-rakers on lower part of anterior arch; origin of anal below or immediately behind last ray of dorsal.
        Head $2\frac{5}{6}$ to $3\frac{1}{5}$ in the length; origin of pelvic below or a little behind pectoral base .... 2. *microps.*
        Head $2\frac{1}{2}$ in the length; origin of pelvic a little in front of pectoral base ...... 3. *lugubris.*
    2. *Dorsal with 12 to 14 (II–III 9–12) rays.*
      a. Dorsal III 9; diameter of eye $4\frac{4}{5}$ to $5\frac{1}{2}$ in head; maxillary extending to below *middle of eye or a little beyond* ...... 4. *nordenskjoeldii.*
      b. Dorsal II–III 11–12; diameter of eye 8 to 11 in head; maxillary extending beyond posterior margin of eye.
        Origin of pelvic distinctly behind pectoral base; snout nearly 4, diameter of eye 8 to 9 in head .... 5. *robustus.*
        Origin of pelvic below or immediately behind pectoral base; snout $3\frac{2}{3}$, diameter of eye about 11 in head ...... 6. *nigrescens.*
  B. A spine on the middle of the snout between the nostrils or anterior parts of the eyes†; origin of anal below posterior half of dorsal.
    1. Origin of pelvic a little in front of pectoral base; caudal peduncle 4 to $4\frac{1}{2}$ times as long as deep; diameter of eye $3\frac{1}{2}$ to $3\frac{3}{4}$ in head .... 7. *megalops.*
    2. Origin of pelvic below or a little behind pectoral base; caudal peduncle $2\frac{1}{4}$ to 3 *times as long as deep.*

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* Ann. & Mag. Nat. Hist. (8) vii. 1911, p. 9.

† Sometimes broken off in much mutilated examples.

a. Diameter of eye 7 to 8½ in head; maxillary extending to a little beyond posterior margin of eye.

* Dorsal III 12–13; origin nearer end of snout than base of caudal; interorbital width 3¼ to 3½ in head.

Head 2⅗ to 2⅔ in the length; last ray of dorsal behind level of middle of anal; caudal peduncle 2½ to 2⅔ times as long as deep .... 8. *cristiceps.*

Head nearly 3 in the length; last ray of dorsal a little in front of level of middle of anal; caudal peduncle nearly 3 times as long as deep .... 9. *crassiceps.*

** Dorsal III 10 (or 11); origin a little nearer base of caudal than end of snout; interorbital width 4⅔ in head. 10. *unicornis.*

b. Diameter of eye 5 to 6⅕ in head; maxillary extending to below middle or posterior part of eye.

Head nearly 3 in the length; origin of dorsal nearer end of snout than base of caudal; caudal peduncle nearly 3 times as long as deep.............. 11. *atlanticus.*

Head 2¼ to 2½ in the length; origin of dorsal nearer base of caudal than end of snout; caudal peduncle 2½ times as long as deep...................... 12. *nigrofulvus.*

II. Less than 20 scales in a longitudinal series.

Anterior profile strongly arched; height of head (at level of præopercular ridge) 1⅕ to 1¼ in its length; diameter of eye 4½ to 5½ in head, length of snout 4⅔ to 5 .... 13. *beanii.*

Anterior profile scarcely arched; height of head (at level of præopercular ridge (1½ to 1¾ in its length; diameter of eye 6 to 7¾ in head, length of snout 4⅕ to 4½ .... 14. *mizolepis.*

1. *Melamphaës typhlops.*

Metopias typhlops, Lowe, Proc. Zool. Soc. xi. 1843, p. 90; *ibid.* xviii. 1850, p. 251.

Melamphaës typhlops, Günther, Cat. Fish. B.M. v. p. 433 (1864); Deep-Sea Fishes 'Challenger,' p. 27, pl. v. fig. A (1887); Goode & Bean, Mem. Mus. Comp. Zool. xxii. 1896, p. 177, fig. 198; Zugmayer, Rés. Camp. Sci. Monaco, xxxv. 1911, p. 98.

Melamphaës typhlops, Roule, Rés. Camp. Sci. Monaco, lii. 1919, p. 43, pl. ii. fig. 5.

Depth of body 4 in the length, length of head 3⅕. Head moderately cavernous, the ridges and crests feebly developed*;

* The appearance of the various ridges and crests on the head in these fishes seems to be dependent to a certain extent on the state of preservation of the specimens, and is, therefore, of doubtful value as a character for distinguishing the species.

margin of præoperculum and operculum entire; ridges on upper part of operculum weak. Snout $5\frac{1}{2}$ in length of head, diameter of eye about 6, interorbital width 3. Mouth moderately oblique, the maxillary extending to beyond posterior margin of eye; teeth small, villiform, in narrow bands in both jaws. 8 or 9 gill-rakers on lower part of anterior arch. About 25 scales in a longitudinal series. Dorsal III 14 (or II 15) *; distance from origin to end of snout $\frac{3}{5}$ of that from origin to base of caudal. Anal I 7; origin well behind level of last ray of dorsal, $2\frac{1}{2}$ times as distant from end of snout as from base of caudal. Pectoral with 15 rays; a little shorter than head, not nearly reaching anal. Pelvic I 7; origin behind pectoral base. Caudal peduncle twice as long as deep, length $4\frac{1}{2}$ in that of fish.

Described from a single specimen, 90 mm. in total length †.

Hab. Eastern North Atlantic.

1. (90 mm.).	Madeira.	Lowe.
? 2. (26 mm.).	6° 55′ N., 15° 54′ W.; 0–800 m.	'Discovery.

In the specimen described and figured by Roule the anal origin is below the last dorsal ray, and the pectoral reaches the anterior rays of the anal; in other respects, however, it agrees closely with the example described above. The fish was 91 mm. in total length, and was found dead at the surface off south-east Portugal.

2. *Melamphaës microps.*

Scopelus microps, Günther, Ann. & Mag. Nat. Hist. (5) ii. 1878, p. 186.
Plectromus suborbitalis, Gill, Proc. U.S. Nat. Mus. vi. 1883, pp. 254, 258 (1884); Goode & Bean, Mem. Mus. Comp. Zool. xxii. 1896, p. 179, fig. 201; Jordan & Evermann, Bull. U.S. Nat. Mus. xlvii. (1) 1896, p. 841, fig. 235; Brauer, 'Valdivia' Tiefsee-Fische, p. 284, pl. xiii. fig. 5 (1906).
Melamphaës microps, Günther, Deep-Sea Fishes 'Challenger,' p. 26 (1887).

Depth of body about 4 in the length, length of head $2\frac{5}{6}$ to $3\frac{1}{5}$. Head moderately cavernous, the ridges and crests being rather feebly developed; margin of præoperculum and operculum entire; ridges on upper part of operculum weak. Snout $4\frac{3}{4}$ to 5 in length of head, diameter of eye 5 to $6\frac{3}{4}$, interorbital width 3 to $3\frac{1}{4}$. Mouth moderately oblique, the maxillary extending to below posterior margin of eye or a little beyond; teeth small, villiform, in two or three irregular series in each jaw. 16 or 17 gill-rakers on lower part of anterior arch. About 30 scales in a longitudinal series. Dorsal III 16–17; distance from origin to end of snout about ⅝ of that from origin to base of caudal. Anal I 8; origin below or immediately behind level of last ray of dorsal, 2¼ to 2½ times as distant from end of snout as from base of caudal. Pectoral with 14 rays, a little shorter than head, not reaching anal. Pelvic I 7; origin below or a little behind pectoral base. Caudal peduncle twice or more than twice as long as deep, 4¼ to 4½ in length of fish.

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* Günther gives VI 11.

† This is not the type, which is said to have been destroyed.

Described from three specimens, 73 to 120 mm. in total length.

Hab. North and South Atlantic; Indian Ocean.

1.	(73 mm.).	39° 27′ N., 71° 15′ W.;	2335 m.	'Albatross.
2.	(75 mm.).	39 40 N., 70 20 W.;	3300 m.	"
? 3.	(31 mm.).	6 55 N., 15 54 W.;	0–800 m.	'Discovery.'
? 4.	(28 mm.).	2 43 S., 00 56 W.;	125–175 m.	"
? 5.	(32 mm.).	32 45 S., 8 47 W.;	650(–0) m.	"
6.	(120 mm.).	46 46 S., 45 31 E.;	2500 m.	'Challenger.'

Type of *M. microps.*

Very close to the preceding species, but seems to differ in the narrower bands of teeth, more numerous gill-rakers, smaller scales, and in the more anterior insertion of the anal fin.

The small specimens mentioned by Goode and Bean, taken by the 'Albatross' at Station 2535 (40° 03′ 30″ N., 67° 27′ 15″ W.; 2150 m.) do not belong to this species.

The type of *M. suborbitalis*, from Station 2036 (38° 52′ N., 69° 24′ W.; 3174 m.), was about 93 mm. in length (without caudal).

3. *Melamphaës lugubris.*

Melamphaës lugubris, Gilbert, Proc. U.S. Nat. Mus. xiii. 1890, p. 59 (1891); Garman, Mem. Mus. Comp. Zool. xxiv. 1899, p. 63.
Plectromus lugubris, Jordan & Evermann, Bull. U.S. Nat. Mus. xlvii. (1), 1896, p. 842.

Perhaps not distinct from *M. microps*. Depth of body 4 in the length, length of head about 2½. Snout nearly 5 in length of head, diameter of eye 7 (6 to 6½), interorbital width 3. Maxillary extending to below posterior margin of eye. 15 gill-rakers on lower part of anterior arch. 26 or 27 scales in a longitudinal series. Dorsal III 15; distance from origin to end of snout ¾ of that from origin to base of caudal. Anal I 8; origin below level of last ray of dorsal, 2½ times as distant from end of snout as from base of caudal. Pectoral with 14 (?) rays; about ¾ length of head, almost reaching origin of anal. Origin of pelvic a little in front of pectoral base. Caudal peduncle about twice as long as deep, 5 in length of fish.

Described from a single specimen, 90 mm. in total length.

Hab. Coast of California and Pacific Coast of Central America.

1. (90 mm.).	Off coast of California (23° N.), 1180 m.	'Albatross.'

4. *Melamphaës nordenskjoeldii.*

Melamphaës (*Plectromus*) *nordenskjoeldii*, Lönnberg, Wiss. Ergebn. Schwedisch. Sudpolar-Exped. 1901–03, v. Lief. 6, p. 58 (1905).

Depth of body 3⅓ in the length, length of head 2⅚ to 3. Head moderately cavernous, the ridges and crests being rather feebly developed; præoperculum with faint striæ ending in very feeble pointed projections; no spines at angle of præopercular ridge; upper part of operculum with two strong diverging ridges, between which are a number of weaker ridges ending in pointed projections; suboperculum ending in a bluntly-pointed projection. Snout about as long as eye, diameter of which is 4⅘ to 5½ in length of head, interorbital width a little more than 3. Mouth moderately oblique, maxillary extending to below middle of eye or a little beyond; teeth very small, villiform, apparently in a single series in each jaw. 20 gill-rakers on lower part of anterior arch. 27 to 29 scales in a longitudinal series. Dorsal III 9; distance from origin to end of snout about $\frac{9}{10}$ of that from origin to base of caudal. Anal I 8; origin below or immediately behind level of last ray of dorsal, 1⅔ to 1¾ times as distant from end of snout as from base of caudal. Pectoral with 14 or 15 rays; nearly as long as head, extending to above origin of anal. Pelvic I 7; origin slightly behind pectoral base. Caudal peduncle twice as long as deep, 3⅗ to 3¾ in length of fish.

Described from two specimens, 72 and 80 mm. in total length.

Hab. South Atlantic.

1. (72 mm.).	33° 25′ S., 8° 31′ E.; 1000(–0) m.	'Discovery.'
2. (80 mm.).	33° 53′ S., 9° 26′ E.; 1000(–0) m.	,,
3–7. (14–26 mm.).	,, ,, ,,	,,

Lophocephalus anthrax (Osorio, J. Sci. Math. Phys. Nat. Lisbonne, (2) vii. no. 27, 1906, p. 173; Mem. Mus. Bocage, i. 1909, p. 8), based on a specimen of 105 mm. taken off the coast of Portugal, is perhaps a synonym of this species. The number of dorsal rays is given as III 11.

5. *Melamphaës robustus.*

Melamphaës robustus, Günther, Deep-Sea Fishes 'Challenger,' p. 29 (1887).
Scopeloberyx opercularis, Zugmayer, Bull. Inst. Ocean. Monaco, 193, 1911, p. 8; Rés. Camp. Sci. Monaco, xxxv. 1911, p. 103, pl. v. fig. 6.
? *Melamphaës nigrescens*, Zugmayer, Rés. Camp. Sci. Monaco, xxxv. 1911, p. 99.
? *Melamphaës malayanus*, Weber, Fische 'Siboga'-Expedition (Monogr. lvii.), p. 187 (1913).
Melamphaës opercularis, Roule, Rés. Camp. Sci. Monaco, lii. 1919, p. 44.

Depth of body $3\frac{1}{2}$ to $3\frac{3}{4}$ in the length, length of head $2\frac{3}{5}$ to $2\frac{4}{5}$. Head cavernous, the ridges and crests well developed but apparently without denticulated margins; a thin paper-like crest between the nostrils; margin of præoperculum entire; no spines at angle of præopercular ridge; ridges on upper part of operculum fairly well developed, ending in feeble pointed projections; suboperculum ending in a pointed process. Snout nearly 4 in length of head, diameter of eye 8 to $9\frac{1}{2}$, interorbital width 4 to $4\frac{1}{4}$. Mouth moderately oblique, the maxillary extending beyond posterior margin of eye; teeth small, villiform, in very narrow bands in both jaws. 14 or 15 gill-rakers on lower part of anterior arch. 26 to 29 (?) scales in a longitudinal series. Dorsal II 11–12; distance from origin to end of snout about equal to that from origin to base of caudal. Anal I 8–9; origin below level of last ray or last ray but one of dorsal, $2\frac{1}{3}$ to $2\frac{2}{5}$ times as distant from end of snout as from base of caudal. Pectoral with 15 rays; about $\frac{3}{4}$ length of head, extending to above origin of anal or a little beyond. Pelvic I 7–8; origin distinctly behind pectoral base. Caudal peduncle a little more than twice as long as deep, $4\frac{1}{4}$ to $4\frac{1}{2}$ in length of fish.

Described from five specimens, 35 to 65 mm. in total length.

Hab. North and South Atlantic; Banda Sea (?).

1. (55 mm.).	39° 27′ N., 71° 15′ W.;	2334 m.	'Albatross.'
2. (50 mm.). Type of the species.	1 47 N., 24 26 W.;	3384 m.	'Challenger.'
3–4. (20–35 mm.).	2 49 S., 9 25 W.;	800–1000(–0) m.	'Discovery.'
5. (65 mm.).	35 54 S., 16 04 E.;	2580 m.	"
6–7. (50–55 mm.).	33 54 S., 16 04 E.;	1310–1410 m.	"
8. (23 mm.). Type of *M. malayanus*.	3 20 S., 127 22 E.;	1536 m.	'Siboga.'

The description of *M. malayanus* was based on three examples, 15 to 23 mm. in total length, from the Manipa Strait and Banda Sea. So far as I am able to judge from an examination of one of these young specimens, *M. malayanus* is a synonym of the species described above.

6. *Melamphaës nigrescens.*

Scopelus crassiceps (part.), Günther, Ann. & Mag. Nat. Hist. (5) ii. 1878, p. 183.
Melamphaës crassiceps (part.), Günther, Deep-Sea Fishes 'Challenger,' p. 28 (1887).
Melamphaës nigrescens, Brauer, 'Valdivia' Tiefsee-Fische, p. 283, pl. xiii. fig. 4 (1906).
? *Melamphaës nycterinus*, Gilbert, Proc. U.S. Nat. Mus. xlviii. 1915, p. 326, pl. xvi. fig. 6.

Depth of body $3\frac{3}{5}$ in the length, length of head $2\frac{3}{5}$. Head moderately cavernous, the ridges and crests being rather feebly developed; apparently a thin paper-like crest between the nostrils; margin of præoperculum and operculum entire; ridges on upper part of operculum rather weak. Snout $3\frac{2}{3}$ in length of head, diameter of eye about 11 (9 to 10), interorbital width 4. Mouth rather strongly oblique, the maxillary extending to a little beyond posterior margin of eye; teeth small, villiform, in very narrow bands in both jaws. 14 or 15 gill-rakers on lower part of anterior arch. About 28 scales in a longitudinal series. Dorsal II 12 (?); distance from origin to end of snout about equal to that from origin to base of caudal. Anal I 8; origin below level of last two or three rays of dorsal, $1\frac{3}{4}$ times as distant from end of snout as from base of caudal. Pectoral with 14 or 15 rays; about $\frac{3}{4}$ length of head, extending to above origin of anal. Pelvic I 7; origin below or a little behind pectoral base. Caudal peduncle twice as long as deep, about $4\frac{1}{4}$ in length of fish.

Described from a single specimen, 68 mm. in total length.

Hab. South Atlantic (?); Indian Ocean; Bay of Bengal; South Pacific.

1. (68 mm.). One of the types of *M. crassiceps.* 0° 42′ S., 147° 0′ E.; 2012 m. 'Challenger.'

Some of the specimens of this species described by Brauer may have belonged to *M. robustus.*

7. *Melamphaës megalops.*

Melamphaës megalops, Lütken, Overs. K. Danske Vid. Selsk. Forhandl. 1877, p. 176, pl. v. figs. 1–3; Günther, Deep-Sea Fishes 'Challenger,' p. 27, pl. v. fig. B (1887); Brauer, 'Valdivia' Tiefsee-Fische, p. 281, pl. xiii. fig. 2 (1906).
Plectromus megalops, Goode & Bean, Mem. Mus. Comp. Zool. xxii. 1896, p. 181.

Plectromus macrophthalmus, Gilchrist, Mar. Invest. S. Africa, ii. 1904, p. 205, pl. xiii. fig. 2; Rep. Fish. Mar. Biol. Surv. S. Africa, 2, Spec. Rep. iii. p. 66 (1922); Barnard, Ann. S. Afric. Mus. xxi. 1925, p. 369, pl. xv. fig. 2.

Depth of body $3\frac{1}{2}$ to 4 in the length, length of head $2\frac{2}{3}$ to about 3. Head rough and cavernous, the ridges and crests being well developed, generally with denticulated edges; a small spine on middle of snout between the nostrils; lower part of præoperculum with well-marked ridges ending in spinous points, which are stronger along the lower margin; two or three spines at angle of præopercular ridge; upper part of operculum with two strong diverging ridges, between which are a number of weaker ridges ending in spinous projections; suboperculum ending in a pointed projection. Snout about $6\frac{1}{2}$ in length of head, diameter of eye $3\frac{1}{2}$ to $3\frac{3}{4}$, interorbital width $1\frac{1}{2}$ to 2. Mouth moderately oblique, the maxillary extending to below middle of eye or beyond; teeth very small, villiform, in one or two series in each jaw; teeth in upper jaw larger than in lower. 17 or 18 gill-rakers on lower part of anterior arch. 30 to 35 scales in a longitudinal series. Dorsal II 10–11; distance from origin to end of snout $\frac{4}{5}$ or $\frac{5}{6}$ of that from origin to base of caudal. Anal I 9–10; origin below posterior half of dorsal, about $1\frac{1}{3}$ times as distant from end of snout as from base of caudal. Pectoral with 12 or 13 rays, longer than head, extending beyond last anal ray. Pelvic I 7; nearly as long as pectoral; origin a little in advance of pectoral base. Caudal peduncle 4 to $4\frac{1}{2}$ times as long as deep, $2\frac{7}{8}$ to $3\frac{1}{5}$ in length of fish.

Described from nine specimens, 32 to 70 mm. in total length.

Hab. North and South Atlantic; Indian Ocean.

1. (35 mm.).	6° 55′ N.,	15° 54′ W.;	0–800 m.	'Discovery.'
2–3. (65–70 mm.).	13 25 N.,	18 22 W.;	0–900 m.	,,
4–5. (27–32 mm.).	13 01 N.,	21 34 W.;	900–1200(–0) m.	,,
6. (60 mm.).	2 49 S.,	9 25 W.;	800–1000(–0) m.	,,
7–8. (43–62 mm.).	24 31 S.,	12 15 E.;	450–550 m.	,,
9. (50 mm.).	33 25 S.,	6 31 E.;	1000(–0) m.	,,

The relatively larger eye of *M. macrophthalmus* is explained by the small size of the specimen, which was only 42 mm. in total length; in other respects it agrees closely with Lütken's species. The type is said to have been lost.

8. *Melamphaës cristiceps.*

Melamphaës cristiceps, Gilbert, Proc. U.S. Nat. Mus. xiii. 1890, p. 60 (1891); *ibid.* xlviii. 1915, p. 324.

Melamphaës beanii (part.), Goode & Bean, Mem. Mus. Comp. Zool. xxii. 1896, p. 179.

Melamphaës frontosus, Garman, Mem. Mus. Comp. Zool. xxiv. 1899, p. 67; Brauer, 'Valdivia' Tiefsee-Fische, p. 285, pl. xiii. figs. 6–7 (1906).

Depth of body 3¾ to 3⅞ in the length, length of head 2⅗ to 2⅔. Head rough and cavernous, the ridges and crests being well developed, some of them with denticulated margins; a strong spine on middle of snout between the nostrils *; lower part of præoperculum with well-marked ridges ending in spinous points, which are stronger along the lower margin; generally two or three spines at angle of præopercular ridge; upper part of operculum with two strong diverging ridges, between which are a number of weaker ridges ending in spinous projections; suboperculum ending in a bluntly pointed projection. Snout 4 to 4½ in length of head, diameter of eye 7 to 8½, interorbital width 3¼ to 3½. Mouth moderately oblique, the maxillary extending to a little beyond posterior margin of eye; a slight knob at symphysis of lower jaw; teeth minute, villiform, in a single series in both jaws. 19 to 22 gill-rakers on lower part of anterior arch. 28 to 30 scales in a longitudinal series. Dorsal III 12–13; origin a little nearer end of snout than base of caudal; last ray behind level of middle of anal. Anal I 9–10; origin below posterior half of dorsal, 1⅔ times to twice as distant from end of snout as from base of caudal; last anal ray distinctly behind last ray of dorsal. Pectoral with 14 or 15 rays; ⅔ length of head, extending to above anal. Pelvic I 7; origin below pectoral base. Caudal peduncle 2½ to 2⅔ times as long as deep, 3⅘ to 4 in length of fish.

Described from five specimens, 78 to 180 mm. in total length.

Hab. Atlantic; Pacific coast of North America.

1. (135 mm.).	39° 33′ N., 71° 16′ W.; 2155 m.	'Albatross.'
2–4. (78–105 mm.).	33 54 S., 16 04 E.; 1310–1410 m.	'Discovery.'
5. (180 mm.).	38 20 S., 22 18 W.; 1800–2000 m.	"
6. (140 mm.).	Off coast of California (33°–35° N.), 1610 m.	'Albatross.'

9. *Melamphaës crassiceps.*

Scopelus crassiceps (part.), Günther, Ann. & Mag. Nat. Hist. (5) ii. 1878, p. 185.
Melamphaës crassiceps (part.), Günther, Deep-Sea Fishes 'Challenger,' p. 28, pl. viii. fig. B (1887).

Closely related to *M. cristiceps*, but length of head nearly 3 in that of fish. Dorsal III 12; origin much nearer end of snout than base of caudal; last ray a little in front of level of middle of anal. Anal I 9; origin below posterior part of dorsal, 1⅗ times as distant from end of snout as from base of caudal. Pectoral ⅚ length of head. Origin of pelvic a little behind pectoral base. Caudal peduncle nearly 3 times as long as deep, 3⅗ in length of fish.

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* Sometimes broken off in mutilated specimens.

Described from a single specimen, 170 mm. in total length.

Hab. Indian Ocean.

1. (170 mm.). One of the types of the species. 46° 46′ S., 45° 31′ E.; 2500 m. 'Challenger.'

10. *Melamphaës unicornis.*

Scopelus crassiceps (part.), Günther, Ann. & Mag. Nat. Hist. (5) ii. 1878, p. 185.

Melamphaës crassiceps (part.), Günther, Deep-Sea Fishes 'Challenger,' p. 28 (1887).

? *Melamphaës maxillaris*, Garman, Mem. Mus. Comp. Zool. xxiv. 1899, p. 66, pl. D. fig. 1.

Melamphaës unicornis, Gilbert, Bull. U.S. Fish. Comm. xxiii. (2), (1903) 1905, p. 615, pl. 77. fig. 1.

? *Plectromus coronatus*, Gilchrist & Von Bonde, Rep. Fish. Mar. Biol. Surv. 3, Spec. Rep. vii. 1924, p. 14; Barnard, Ann. S. Afric. Mus. xxi. 1925, p. 369.

Depth of body 3⅘ in the length, length of head 2⅓. Head rough and cavernous, the ridges and crests being well developed, generally with denticulated margins; a strong spine on middle of snout between the nostrils; præoperculum with well-marked ridges ending in slender spinous points, which are stronger along the lower margin; two or three spines at angle of præopercular ridge; upper part of operculum with two strong diverging ridges. Snout 3⅗ in length of head, diameter of eye about 7; interorbital width 4⅔. Mouth moderately oblique, the maxillary extending to a little beyond posterior margin of eye; teeth very small, villiform, in one or two irregular series in both jaws. 22 gill-rakers on lower part of anterior arch *. About 25 scales in a longitudinal series. Dorsal III 10 (or 11); origin very slightly nearer base of caudal than end of snout; last ray above level of middle of anal. Anal I 9; origin below posterior part of dorsal, about twice as distant from end of snout as from base of caudal; last anal ray distinctly behind last ray of dorsal. Pectoral with 14 rays; about ⅘ length of head, extending to beyond last anal ray. Pelvic I 7; origin below pectoral base. Caudal peduncle 2⅓ times as long as deep, more than 4 times in length of fish.

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* Gilbert gives the number of gill-rakers in *M. unicornis* as 8+15, but his example was only 31 mm. in length.

Described from a single specimen, 60 mm. in total length.

Hab. South Atlantic; Hawaiian Islands; Pacific coast of South America (?).

1. (60 mm.). One of the types of *M. crassiceps.* 8° 37′ S., 34° 28′ W.; 1235 mm. 'Challenger.'

This species is close to *M. cristiceps* and *M. crassiceps*, but may be distinguished by the larger head, narrower interorbital region, more posterior position of dorsal and anal fins, and by the somewhat shorter caudal peduncle. It differs from *M. nigrofulvus* in the smaller eye, larger mouth, more anterior position of the dorsal fin, and smaller number of dorsal rays.

The origin of the anal fin in *M. maxillaris* is said to be "on a vertical from the hinder end of the dorsal." Garman's figure shows, however, that his specimen was much distorted, and it seems probable that his species is synonymous with *M. unicornis.*

In the exceedingly brief description of the type-specimens of *M. coronatus* taken off South Africa, no mention is made of the size of the mouth or of the positions of the dorsal and anal fins, nor is the length of the specimens stated. It may be this species.

11. *Melamphaës atlanticus*, sp. n.

Depth of body $3\frac{4}{5}$ to 4 in the length, length of head nearly 3. Head rough and cavernous, the ridges and crests being well developed, generally with denticulated margins; a strong spine on middle of snout between the nostrils; præoperculum with well-marked ridges ending in spinous points, which are stronger along the lower margin; several spines at angle of præopercular ridge; upper part of operculum with two strong diverging ridges, between which are a number of very feeble ridges ending in pointed projections; suboperculum ending in a bluntly pointed projection. Snout a little more than 4 times in length of head, diameter of eye $5\frac{2}{3}$ to $6\frac{1}{5}$, interorbital width $3\frac{1}{4}$. Mouth moderately oblique, the maxillary extending to below posterior $\frac{1}{4}$ of eye; teeth minute, villiform, apparently in a single series in both jaws. 19 to 21 gill-rakers on lower part of anterior arch. 26 to 28 scales in a longitudinal series. Dorsal III 13–15; distance from origin to end of snout $\frac{3}{4}$ to $\frac{4}{5}$ of that from origin to base of caudal. Anal I 9–11; origin below posterior $\frac{1}{2}$ of dorsal, $1\frac{1}{2}$ to $1\frac{3}{5}$ times as distant from end of snout as from base of caudal; last anal ray a very little behind last ray of dorsal. Pectoral with 15 rays; nearly as long as head, extending to above middle of anal or beyond. Pelvic I 7; origin below or a little behind pectoral base. Caudal peduncle nearly 3 times as long as deep, $3\frac{2}{5}$ to $3\frac{3}{5}$ in length of fish.

Described from five specimens, 75 to 125 mm. in total length.

Hab. South Atlantic.

1–2. (105–110 mm.*).	33° 54′ S., 16° 04′ E.;	850–950 m.	'Discovery.'
3. (125 mm.).	46 56 S., 46 03 W.;	1050–1350(–0)m.	„
4–5. (75–78 mm.).	53 25 S., 35 15 W.;	1025–1275 m.	„

12. *Melamphaës nigrofulvus.*

Melamphaës nigrofulvus, Garman, Mem. Mus. Comp. Zool. xxiv. 1899, p. 64, pl. D. fig. 2, pl. lxxii. fig. 2; Brauer, 'Valdivia' Tiefsee-Fische, p. 282, pl. xiii. fig. 3 (1906).

Very close to *M. atlanticus*, but length of head $2\frac{1}{4}$ to $2\frac{1}{2}$ in that of fish (without caudal). Dorsal III 11–12; distance from origin to end of snout greater than that from origin to base of caudal; last anal ray distinctly behind last ray of dorsal. Caudal peduncle $2\frac{1}{2}$ times as long as deep, about four times in length of fish.

Hab. Gulf of Panama (Pacific); Gulf of Guinea (Atlantic).

The length of the type, taken by the 'Albatross' at Station 3382 (6° 21′ N., 80° 41′ W.; 3280 m.), is not stated by Garman. Brauer's largest specimen was 25 mm.

13. *Melamphaës beanii.*

Plectromus crassiceps (*non* Günther), Bean, Proc. U.S. Nat. Mus. viii. 1885, p. 73 (1886); Jordan & Evermann, Bull. U.S. Nat. Mus. xlvii. (4), 1900, pl. cxxx. fig. 356.

Melamphaës beanii, Günther, Deep-Sea Fishes 'Challenger,' p. 29 (1887).

Scopelogadus cocles, Vaillant, Expéd. Sci. 'Travailleur' et 'Talisman,' Poissons, pp. 143, 385, pl. xxvi. fig. 6 (1888).

Plectromus beanii, Goode & Bean, Mem. Mus. Comp. Zool. xxii. 1896, p. 179, fig. 202; Jordan & Evermann, Bull. U.S. Nat. Mus. xlvii. (1), 1896, p. 842.

Melamphaës eurylepis, Holt & Byrne, Fish. Ireland, Sci. Invest. 1905, ii. 1906, p. 19, pl. i. figs. 1–2.

? *Melamphaës mizolepis*, Zugmayer, Rés. Camp. Sci. Monaco, xxxv. 1911, p. 96, pl. v. fig. 1.

Depth of body $3\frac{1}{3}$ to $3\frac{4}{5}$ in the length, length of head $2\frac{2}{3}$ to a little more than 3. Anterior profile strongly arched, the height of the head (at level of præopercular ridge) $1\frac{1}{5}$ to $1\frac{1}{2}$ in its length. Head very cavernous, the ridges and crests thin, paper-like, generally high; a pair of parallel crests lying close together on middle of snout between the nostrils; two or three feeble spinous points at angle of præopercular ridge; præoperculum and operculum with a series of ridges or striæ ending in weak pointed projections; suboperculum not produced or ending in a very slight projection. Snout 4⅔ to 5 in length of head, diameter of eye 4½ to 5½, interorbital width 2½ to 3⅓. Mouth moderately oblique, the maxillary extending to below middle or posterior part of eye; lower mandibular crests united to form a high sharp ridge; teeth minute, villiform, apparently in a single series in both jaws. 16 to 20 gill-rakers on lower part of anterior arch. 11 to 15 scales in a longitudinal series *. Dorsal II or III 10–12; distance from origin to end of snout ⅔ to ⅚ of that between origin and base of caudal. Anal I or II 8; origin below middle or posterior part of dorsal, 1⅙ to 1 1¼ times as distant from end of snout as from base of caudal. Pectoral with 14 or 15 rays, nearly as long as head, extending to above posterior rays of anal or beyond. Pelvic I 7; origin below pectoral base. Caudal peduncle 3 to 3¾ times as long as deep, 2¾ to 3¼ in length of fish.

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* The smaller of these specimens is selected as the holotype.

Described from several specimens, 65 to 130 mm. in total length.

Hab. North and South Atlantic.

1. (79 mm.).	Type of *M. eurylepis*.	54° 57′ N., 10° 5′ W.; 1280 m.	‘Helga.’
2. (120 mm.).	Paratypes of *M. beanii*.	41 40 N., 65 35 W.; 1564 m.	‘Albatross.’
3. (115 mm.).		39 44 N., 71 04 W.; 1870 m.	,,
4. (120 mm.).		37 41 N., 73 03 W.; 2739 m.	,,
5. (125 mm.).		40 09 N., 67 09 W.; 2480 m.	,,
6. (120 mm.).		39 38 N., 71 39 W.; — m.	,,
7. (55 mm.).		39 33 N., 70 50 W.; 1622 m.	,,
8. (115 mm.).		37 34 N., 73 58 W.; — m.	,,
9. (80 mm.).	One of the types of *Scopelogadus cocles*.	Near Cape Verde; 1090 m.	‘Travailleur’ & ‘Talisman.’
10–16. (60–75 mm.).		15° 55′ S., 10° 35′ E.; 600–700 m.	‘Discovery.’
17–18. (53-115 mm.).		24 31 S., 12 15 E.; 450–550(–0) m.	,,
19. (125mm.).		32° 20′–33° 46′ S., 15° 08′–15° 18′ E.; 900-1000m.	,,
20–21. (45–70 mm.).		33° 25′ S., 6° 31′ E.; 1000(–0) m.	,,
22–23. (128–130 mm.).		33 53 S., 9 26 E.; 1000(–0) m.	,,
24–25. (75–120 mm.).		33 54 S., 16 04 E.; 850–950 m.	,,
26. (105 mm.).		35 18 S., 19 01 W.; 1000(–0) m.	,,

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* In the description of *M. beanii*, the number of scales is given as about 25, but they are said to be "mostly wanting in the typical examples." I have examined nearly all the specimens mentioned by Goode and Bean, including the example figured, and estimate the maximum number as 15.

The type of *Scopelogadus cocles* examined is in a poor state of preservation, but almost certainly belongs to this species.

14. *Melamphaës mizolepis.*

Scopelus mizolepis, Günther, Ann. & Mag. Nat. Hist. (5) ii. 1878, p. 185.
Melamphaës mizolepis, Günther, Deep-Sea Fishes 'Challenger,' p. 28 (1887); Alcock, Ann. & Mag. Nat. Hist. (6) vi. 1890, p. 201; Cat. Indian Deep-Sea Fishes, p. 37 (1899); Garman, Mem. Mus. Comp. Zool. xxiv. 1899, p. 62; Brauer, 'Valdivia' Tiefsee-Fische, p. 280, pl. xiii. fig. 1 (1906); Roule, Rés. Camp. Sci. Monaco, lii. 1919, p. 44; Gilchrist, Rep. Fish. Mar. Biol. Surv. S. Africa, 2, Spec. Rep. iii. 1922, p. 65; Barnard, Ann. S. Afric. Mus. xxi. 1925, p. 368.
? *Melamphaës bispinosus*, Gilbert, Proc. U.S. Nat. Mus. xlviii. 1915, p. 325, pl. xv. fig. 5.

Close to the preceding species, but length of head 2½ to 2⅔ in that of fish (without caudal). Anterior profile little arched, the upper profile of head straight or even a little concave above eyes; height of head (at level of præopercular ridge) 1½ to 1¾ in its length; ridges and crests on head lower; suboperculum produced upwards and backwards to form a pointed projection. Snout 4⅕ to 4½ in length of head, diameter of eye 6 to 7¾, interorbital width 3⅓ to 3⅔. 15 to 17 gill-rakers on lower part of anterior arch. 12 to 14 (16) scales in a longitudinal series. Dorsal II or III 9–11. Anal I or II 8. Caudal peduncle 2½ to 3 times as long as deep, 3 to 3⅖ in length of fish.

Described from several specimens, 35 to 85 mm. in total length.

Hab. North and South Atlantic; Indian Ocean; Bay of Bengal; Indo-Australian Archipelago; Coast of California; Gulf of Panama.

1–5.	(48–85 mm.).	13° 25′ N.,	18° 22′ W.;	900(–0) m.	'Discovery.'
6–30.	(20–75 mm.).	00 56 S.,	14 08 W.;	250(–0) m.	,,
31–42.	(35–60 mm.).	2 43 S.,	00 56 W.;	125–175(–0) m.	,,
43.	(70 mm.).	5 41 S.,	134 4 E.;	1464 m.	'Challenger.'

Type of the species.

Some of the records of this species included in the above synonymy perhaps refer to *M. beanii*.

M. bispinosus, from the coast of Southern California, is said to have 23 to 25 scales in a longitudinal series, but Gilbert states that the scales were all missing and the pouches indistinct. In all other characters his specimens seem to agree closely with those described above.

XV.—*The Genotypes of the Genera of Graptolites.*

By O. M. B. BULMAN, Ph.D., D.I.C., A.R.C.S.

THIS paper embodies the results of an investigation of the types of the graptolite genera, undertaken originally in connection with the commoner forms, but extended later in the hope that a full list might prove of value to those engaged in a study of these fossils. Bibliographies with the genotypes stated are not common for this group, and there seems to be no list of the graptolites of more than one country.

There are a few instances where different types have been adopted for the same genus by different authors, and some types have been quoted which are not even among the original genosyntypes of the genera concerned, but it is unnecessary to particularise. More serious complications have resulted from the absence of stated types. For example, several of the older genera were founded on what were later realised to be ill-chosen groups of species, and sometimes these genera have been superseded and regarded as synonyms of certain later genera. But genolectotypes of the early genera were not, as a rule, chosen, and from the standpoint of priority many of the later genera were thus placed in an unsatisfactory position. In such cases the writer has selected genolectotypes, and attempted to fix the synonymy of the forms in question.

For guidance and assistance in determining many of the synonymies the writer is greatly indebted to Dr. G. L. Elles, whilst his thanks are due to Prof. W. W. Watts, F.R.S., for helpful criticism of the MS., and to Dr. W. D. Lang, F.R.S., to Mr. C. D. Sherborn, and to Dr. H. D. Thomas for advice on matters of nomenclature. Acknowledgments are also made of the services rendered by the Assistants in the Geological and General Libraries of the British Museum (Natural History).

PRELIMINARY NOTES.

1. *Cladograpsus*, Geinitz, 1852. *Graptolithus murchisoni*, Beck, has been separated from *G. ramosus* and *G. furcatus* as the genolectotype of *Cladograpsus*, Geinitz, which thus becomes a synonym of *Didymograptus*, M'Coy, 1851. *Dicranograptus*, Hall, 1865, with *Graptolithus ramosus*, Hall, as its type, is therefore a valid genus, and the name *Cladograpsus* is preoccupied when used by Emmons (1855) and Carruthers (1858); *Cladograpsus*, Emmons, is considered a synonym of *Dicranograptus*, Hall (to which genus all the genosyntypes are referable), whilst *Cladograpsus*, Carruthers, is a synonym of *Pleurograptus*, Nicholson, 1867.

2. *Cœnograptus*, Hall, 1868. *Graptolithus gracilis*, Hall, 1848, has been here selected as the genolectotype of *Cœnograptus*, Hall, which thus becomes a synonym of *Nemagraptus*, Emmons, 1855. The genolectotype of the last—*Nemagrapsus elegans*, Emmons—was selected by Hall (1868, p. 211), and identified with

his *Graptolithus gracilis*. *Amphigraptus*, Lapworth, 1873, with *Graptolithus divergens*, Hall (a genosyntype of *Cœnograptus*), as its type, is therefore a valid genus.

3. *Diplograptus*, M'Coy, 1850. Of the three genosyntypes of this genus, *Prionotus pristis*, Hisinger, was mentioned as type by Gurley in 1896. The remaining two have since been transferred to *Climacograptus*, Hall. The genus has been subdivided by Lapworth and others, but no *Diplograptus*, sensu stricto, retained. Obviously the subgenus to which the genolectotype is referable must be taken as *Diplograptus*, s. str., and though Elles and Wood (1907, p. 245) speak of "*Diplograptus* (*Orthograptus*) *pristis* (Hisinger)," Dr. Elles informs me that Hisinger's species, in the light of more recent knowledge, should be referred to *Mesograptus*, Elles and Wood, 1907. Similarly, in the subdivision of *Retiolites*, Barrande, 1850, the subgenus *Gladiograptus*, Lapworth, 1875, with *Retiolites geinitzianus* as its type, is synonymous with *Retiolites*, s. str., and *Thysanograptus*, Elles & Wood, is synonymous with *Lasiograptus*, Lapworth, s. str.

4. *Graptolithus*, Linnæus, 1735, and 1768, p. 173. The name was originally employed for inorganic markings such as dendritic incrustations and "ruin-marble," and although, in the later definition, a fossil plant (*G. sagittarius*, Linn., 1768) and a graptolite (*G. scalaris*, Linn., 1768) were included, the name *Graptolithus* was still considered by Linnæus to cover inorganic objects simulating fossils.

The modification to the sense in which it was widely employed in the middle of last century appears to be due to Wahlenberg, 1821. Barrande (1850, p. 34) cited *G. scalaris*, Linn., as type, considering this species to be the same as *G. sagittarius*, Linn., while Hall (1868, p. 228) rejected the synonymity of the forms and adhered to *G. scalaris* as type. The term came gradually to denote the whole group of the graptolites, and has fallen into disuse as a generic name. The writer agrees with Gurley (1896, p. 98) that it should be abandoned. It may, perhaps, be regarded as one of the "collective groups" (not requiring type-species) mentioned in Art. 8 (recommendation).

For early history of this term see also Elles and Wood, 1902, p. iii *et seq.*

5. *Monograptus*, Geinitz, 1852. There is considerable confusion regarding the early history of the genus thus denoted, but the position is briefly as follows:—

The genus *Lomatoceras* was erected by Bronn (1835, p. 55), with *L. priodon* as genotype. This was stated by Beck (in Murchison, 'Silurian System,' p. 696) to be preoccupied for a genus of insect. The name was used by Eichwald (1840, p. 101), but apparently not by any other authors, and was withdrawn by Bronn in 1848 (pp. 551 & 667), presumably on grounds of preoccupation, the species being referred in this work to *Graptolithus*, Linn. (also Bronn, 1849, p. 149).

Barrande, in 1850, erected *Monoprion*, with fourteen genosyntypes, including *Lomatoceras priodon*, Bronn, no type being stated. Geinitz, in 1852, erected the genus *Monograpsus*, embracing *Monoprion*, Barr., and *Rastrites*, Barr., with twenty-eight genosyntypes, including *Lomatoceras priodon*, Bronn. He stated that the change of name was made in order to bring the termination into correspondence with *Diplograpsus* etc. Miller (1889, p. 196) seems to have thought that the genus was erected by Emmons, who mentioned it in 1855 without quoting its authorship. *Monograptus priodon* (Bronn) was cited as "example" by Lapworth, 1873 (table i, p. 555), and this has always been the implied type, although the first definite statement to the effect that this *is* the type seems to be in Bassler, 1915, p. 822.

Gurley (1896, p. 79) remarked that he could find no trace of the preoccupation of *Lomatoceras*, Bronn, 1835, which should therefore have priority. There is no reference to more than one genus of this name in Sherborn (1927), and Mr. Sherborn informs me that he can find no evidence for the existence of any genus of this name other than that of Bronn.

The name *Monograptus* is so well established, having been used for nearly eighty years by the authorities of all countries, that it should clearly be placed on the list of *nomina conservanda*.

The genus has been the subject of repeated attempts at subdivision by German authors, but the value of many of these subgenera is doubtful, and they are here all regarded as synonyms of *Monograptus*.

6. *Prionotus*, Nilsson MS., Hisinger, 1837. About the year 1830 Nilsson proposed, apparently in manuscript, to change the name *Graptolithus*, Linnæus, to *Priodon*, and, finding that name preoccupied, suggested the use of *Prionotus*, which name was published in Hisinger, 1837, p. 113. This name is also stated to be preoccupied. It is not clear for what reason this change was advocated, and the name (a synonym of *Graptolithus*, Linn.) soon fell into disuse. An account of this will be found in Tullberg, 1882, p. 7, and Elles and Wood, 1902, p. vii.

7. *Tetragraptus*, Salter, 1863. The type of this genus, frequently misquoted, was stated by Salter in the explanation of text-figure on p. 137 and p. 138 to be *Graptolithus bryonoides*, Hall, 1858; see also Hall, 1868, p. 209. This has later been identified with *Fucoides serra*, Brongniart, 1828, so that the type-species is *Tetragraptus serra* (Brong.).

8. Several of the forms figured and described by Goeppert ("Die fossile Flora der silurischen . . .," Acad. Cæs.-Leop., Nova Acta, vol. xxvii. 1860) show resemblances to certain dendroid graptolites, and have in some cases been included in the synonymies; the

figures are rather difficult to identify, but the following have been cited by Elles and Wood:—

Calithamnion reussianum = *Ptilograptus*, Hall.
Chondrites fruticulosum = ? *Dendrograptus*, Hall.
Sphærococcites scharyanus = ? *Callograptus*, Hall.

9. Authors and references cited after the name of a genolectotype in the following list are the authorities for the selection of that type. Obsolete names, and names here regarded as synonyms, are printed in italic, the remainder in small capitals.

ACANTHOGRAPTUS, Spencer, 1878, p. 461; genotype, *A. granti*, Spencer, 1878, p. 461.

AIROGRAPTUS, Ruedemann, 1916, p. 20; genotype, *Dictyonema furciferum*, Ruedemann, 1904, p. 606, pl. iii. fig. 11.

AKIDOGRAPTUS, Davies, 1929, p. 9; genotype, *A. ascensus*, Davies, 1929, p. 9, figs. 22–24. (Subgenus of *Diplograptus*, M'Coy.) According to the rules of transcription this should be "*Acidograptus*."

AMPHIGRAPTUS, Lapworth, 1873, p. 559; genotype, *Graptolithus divergens*, Hall, 1859, p. 509, fig. 9. (Synonym, *Cœnograptus*, Hall, 1868, partim.)

AMPLEXOGRAPTUS, Lapworth MS., Elles and Wood, 1907, pp. 258 & 267; genotype, *Diplograptus perexcavatus*, Lapworth, 1876*a*, pl. ii. fig. 38. (Subgenus of *Diplograptus*, M'Coy.)

ANOMALOGRAPTUS, Clark, 1924, p. 63; genotype, *A. reliquus*, Clark, 1924, p. 64, pl. v. figs. 3–5. This genus was founded for a "*Clonograptus*" with reduced stripes, but it may well be a synonym of *Loganograptus*, Hall.

ANTHOGRAPTUS, Törnquist, 1904, p. 22; genotype, *A. nidus*, Törnquist, 1904, p. 22, pl. iv. figs. 4–5.

ASCOGRAPTUS, Ruedemann, 1925, p. 18; genotype, *A. similis*, Ruedemann, 1925, p. 18, pl. vi. figs. 1–8.

ATOPOGRAPTUS, Harris, 1926, p. 59; genotype, *A. woodwardi*, Harris, 1926, p. 59, pl. ii. figs. 12–15.

AZYGOGRAPTUS, Nicholson and Lapworth, in Nicholson, 1875, p. 269; genotype, *A. lapworthi*, Nicholson, 1875, p. 269, pl. vii. fig. 2.

Birastrites, Geinitz, 1866, p. 125; genosyntypes, *Thamnograptus anna*, Hall, 1865, p. 141, pl. xxi. fig. 9; *Buthograptus laxus*, Hall, 1861, p. 19. *Buthograptus laxus*, Hall, 1861, is here selected as the genolectotype, and the genus becomes a synonym of *Buthograptus*, Hall.

BRYOGRAPTUS, Lapworth, 1880, p. 164; genosyntypes, *B. kjerulfi*, Lapworth, 1880, p. 164, pl. v. fig. 22; *B. callavei*, Lapworth, 1880, p. 165, pl. v. fig. 21; genolectotype, *B. kjerulfi*, Lapworth, 1880 (Gurley, 1896, p. 64).

BUTHOGRAPTUS, Hall, 1861, p. 18; genotype, *B. laxus*, Hall, 1861, p. 19. The genus can only be referred doubtfully to the Graptolithina. (Synonym, *Birastrites*, Geinitz, 1866).

CACTOGRAPTUS, Ruedemann, 1908, p. 196; genotype, *C. crassus*, Ruedemann, 1908, p. 197, pl. viii. fig. 1.

CALAMOGRAPTUS, Clark, 1924, p. 61; genotype, *C. porrectus*, Clark, 1924, p. 62, pl. v. figs. 1, 2.

CALLOGRAPTUS, Hall, 1865, p. 133; genosyntypes, *C. elegans*, Hall, 1865, p. 134, pl. xix. figs. 1–4, pl. xviii. fig. 4; *C. salteri*, Hall, 1865, p. 135, pl. xix. figs. 5–8; genolectotype, *C. elegans*, Hall, 1865 (Miller, 1889, p. 175). (Synonym, *Odontocaulis*, Lapworth, 1881.)

CALYPTOGRAPTUS, Spencer, 1878, p. 459; genosyntypes, *C. cyathiformis*, Spencer, 1878, p. 459; *C. subretiformis*, Spencer, 1878, p. 460; genolectotype, *C. cyathiformis*, Spencer, 1878 (Miller, 1889, p. 175). The other genosyntype, *C. subretiformis*, was referred to *Dictyonema* by Bassler, 1909, p. 26.

CARDIOGRAPTUS, Harris and Keble, 1916, p. 66; genotype, *C. morsus*, Harris and Keble, 1916, p. 66, pl. i. figs. 1–4. Possibly referable to *Phyllograptus*, Hall.

CEPHALOGRAPTUS, Hopkinson, 1869, p. 159; genotype, *Diplograpsus cometa*, Geinitz, 1852 *a*, p. 26, pl. i. fig. 28. (Subgenus of *Diplograptus*, M'Coy.)

CERAMOGRAPTUS, Hudson, 1915, p. 129; genotype, *C. ruedemanni*, Hudson, 1915, p. 129, pl. ii.

CHAUNOGRAPTUS, Hall, 1882, p. 225; genotype, *Dendrograptus* (*Chaunograptus*) *novellus*, Hall, 1882, p. 225, pl. i. figs. 1, 2. (Synonym, *Thallograptus*, Öpik, non Ruedemann.)

Cladograpsus, Geinitz, 1852 *a*, p. 29, 1852 *b*, p. 389; genosyntypes, *Graptolithus ramosus*, Hall, 1848, p. 270, pl. lxxiii. fig. 3; *Graptolithus furcatus*, Hall, 1848, p. 273, pl. lxxiv. fig. 4; *Graptolithus murchisoni*, Beck, 1839, p. 694, pl. xxvi. fig. 4 (cited by Geinitz as type of "group *b*" of the genus *Cladograpsus*); genolectotype, *Graptolithus murchisoni*, Beck, is here selected, the genus becoming a synonym of *Didymograptus*, M'Coy. See note 1, p. 169.

Cladograpsus, Emmons, 1855, p. 107; genosyntypes, *C. dissimilaris*, Emmons, 1855, p. 107, pl. i. fig. 15; *C. inæqualis*, Emmons, 1855, p. 107; *C.* sp. indet., Emmons, 1855, pl. i. fig. 12; genolectotype, *C. dissimilis*, Emmons, is here selected. The genus is preoccupied by Geinitz, 1852, and all the genosyntypes are referable to *Dicranograptus*, Hall, of which genus this is a synonym.

Cladograpsus, Carruthers, 1858, p. 467; genotype, *C. linearis*, Carruthers, 1858, p. 467, text-fig. (Synonym of *Pleurograptus*, Nicholson, 1867, the name being preoccupied.)

Clathrograptus, Lapworth, 1873, p. 559; genotype, *C. cuneiformis*, Lapworth, 1873, p. 559. (Synonym of *Retiograptus*, Hall, 1859. See Elles & Wood, 1908, p. 315.)

CLEMATOGRAPTUS, Hopkinson, 1875, p. 652; genotype, *C. implicatus*, Hopkinson, 1875, p. 652, pl. xxxiv. fig. 1.

CLIMACOGRAPTUS, Hall, 1865, p. 111; genotype, *Graptolithus bicornis*, Hall, 1848, p. 268, pl. lxxiii. fig. 2.

CLONOGRAPTUS, Hall and Nicholson, 1873, p. 138; genosyntypes, *Graptolithus rigidus*, Hall, 1858 *a*, p. 146, 1858 *b*, p. 121; *Graptolithus flexilis*, Hall, 1858 *a*, p. 145, 1858 *b*, p. 119: genolectotype, *G. rigidus*, Hall (Miller, 1889, p. 179).

Cœnograptus, Hall, 1868, p. 217; genosyntypes, *Graptolithus gracilis*, Hall, 1848, p. 274, pl. lxxiv. fig. 6; *Graptolithus divergens*, Hall, 1859, p. 509, fig. 9; *Graptolithus gracilis*, Hall, is here selected as the genolectotype, *Cœnograptus*, Hall, becoming a synonym of *Nemagraptus*, Emmons, 1855. See note 2, p. 169.

CORYNOIDES, Nicholson, 1867, p. 108; genotype, *C. calicularis*, Nicholson, 1867, p. 108, pl. vii. figs. 9–11. This genus is referred with some doubt to the Graptolithina.

CRYPTOGRAPTUS, Lapworth, 1880, p. 174; genotype, *Diplograptus tricornis*, Carruthers, 1859, p. 25. This was proposed as a subgenus of *Diplograptus*, but was raised to generic rank by Elles and Wood, 1908, p. 295.

CTENOGRAPTUS, Nicholson, 1876, p. 248; genotype, *Dichograptus annulatus*, Nicholson, 1869, p. 233, pl. xi. figs. 4, 5.

CYCLOGRAPTUS, Spencer, 1883, p. 365 (1884 *a*, p. 42, and 1884 *b*, p. 592); genotype, *C. rotadentatus*, Spencer, 1884 *a*, p. 42 (1884 *b*, p. 592), pl. iv. fig. 6.

CYRTOGRAPTUS, Carruthers, 1867, p. 540; genotype, *C. murchisoni*, Carruthers, 1867, p. 540, foss. 90, fig. 1.

Damesograptus, Jahn, 1892, p. 4; genotype, *Dictyonema* [sp.], Dames, 1873, p. 383, pl. xii. figs. 5–8. (Synonym of *Dictyonema*, Hall, 1851.)

Dawsonia, Nicholson, 1873, p. 139; genosyntypes, *D. acuminata*, Nicholson, 1873, p. 140, fig. 3 *a*; *D. rotunda*, Nicholson, 1873, p. 141, fig. 3 *b*; *D. tenuistriata*, Nicholson, 1873, p. 141, fig. 3 *c*, *d*; *D. campanulata*, Nicholson, 1873, p. 142, figs. 3 *e*, *f*; genolectotype, *D. campanulata*, Nicholson (Miller, 1889, p. 184). This genus is only doubtfully referable to the Graptolithina.

Demirastrites, Eisel, 1912, p. 27; genosyntypes, ten species of *Monograptus*, of which *Rastrites triangulatus*, Harkness, 1851, p. 59, pl. i. fig. 3, is here chosen as the genolectotype; the genus is regarded as a synonym of *Monograptus*, Geinitz.

DENDROGRAPTUS, Hall, 1858 *b*, p. 143; genotype, *Graptolithus hallianus*, Prout, 1851, p. 189, figs. 1, 2.

DESMOGRAPTUS, Hopkinson, 1875, p. 668; genotype, *Dictyograptus cancellatus*, Hopkinson, 1875, p. 668, pl. xxxvi. fig. 11.

DICELLOGRAPTUS, Hopkinson, 1871, p. 20; genosyntypes, *Cladograpsus forchammeri*, Geinitz, 1852 *a*, p. 31, pl. v. figs. 28–31; *Didymograpsus flaccidus*, Nicholson, 1867, p. 110, pl. vii. figs. 1–3 = *Dicellograptus morrissi*, Hopkinson, 1871, p. 24, pl. i. fig. 2; *Didymograpsus elegans*, Carruthers, 1868, p. 129, pl. v. fig. 8; *Didymograpsus moffatensis*, Carruthers, 1858, p. 469, fig. 3; *Didymograpsus anceps*, Nicholson, 1867, p. 110, pl. viii. figs. 18–20; genolectotype, *Didymograpsus elegans*, Carruthers, 1868 (Gurley, 1896, p. 70). (Synonym, *Cladograpsus*, Geinitz, 1852, partim.)

DICHOGRAPTUS, Salter, 1863, p. 139; genosyntypes, *Dichograptus aranea*, Salter, 1863, p. 137, fig. 9; *D. sedgwicki*, Salter, 1863, p. 137, fig. 11; genolectotype, *D. aranea*, Salter, 1863 = *Graptolithus octobrachiatus*, Hall, 1858 *b*, p. 122, and 1858 *a*, p. 147. (The latter species was cited as type by Barrois, 1893, p. 108.)

DICRANOGRAPTUS, Hall, 1865, p. 112; genotype, *Graptolithus ramosus*, Hall, 1848, p. 270, pl. lxxiii. fig. 3. (Synonyms, *Cladograpsus*, Emmons, 1885, and *Cladograpsus*, Geinitz, 1852, partim.)

Dictyodendron, Westergård, 1909, p. 63; the name was proposed for species of *Dictyonema* other than *D. flabelliforme* (Eichw.), and is a synonym of *Dictyonema*, Hall, 1851.

Dictyograptus, Hopkinson, 1875, p. 667; a proposed alteration of name on the grounds that *Dictyonema* was preoccupied for a genus of plants.

Dictyograptus, Westergård, 1909, p. 63; genotype, *Gorgonia flabelliformis*, Eichwald, 1840, p. 207. (Synonym of *Dictyonema*, Hall, 1851.)

DICTYONEMA, Hall, 1851, p. 401 (1852, p. 174); genosyntypes *Gorgonia? retiformis*, Hall, 1843, p. 115, fig. 42 (1); *Gorgonia?*, Hall, 1843, p. 115, fig. 42 (2); genolectotype, *Gorgonia? retiformis*, Hall, 1843 (Miller, 1889, p. 185). (Synonyms, *Damesograptus*, Jahn, 1892; *Dictyodendron*, Westergård, 1909; *Dictyograptus*, Hopkinson, 1875; *Dictyograptus*, Westergård, 1909; *Graptopora*, Salter, 1857;

Phyllograpta, Angelin, 1854; and *Rhabdinopora*, Eichwald, 1855.)

DIDYMOGRAPTUS, M'Coy, 1851, p. 9; genosyntypes, *Graptolithus serratulus*, Hall, 1848, p. 274, pl. lxxiv. fig. 5; *Graptolithus murchisoni*, Beck, 1839, pp. 694 & 695, pl. xxvi. fig. 4; genolectotype, *Graptolithus murchisoni*, Beck (Miller, 1889, p. 185). (Synonyms, *Cladograpsus*, Geinitz, 1852, partim; ? *Janograptus*, Tullberg, 1880.)

DIMORPHOGRAPTUS, Lapworth, 1876 *b*, p. 545; genosyntypes, *D. elongatus*, Lapworth, 1876 *b*, p. 547, pl. xx. fig. 12; *D. swanstoni*, Lapworth, 1876 *b*, p. 548, pl. xx. fig. 13; genolectotype, *D. elongatus*, Lapworth (Bassler, 1915, p. 441).

DIPLOGRAPTUS, M'Coy, 1850, p. 271; genosyntypes, *Diplograpsis rectangularis*, M'Coy, 1850, p. 271; *Prionotus pristis*, Hisinger, 1837, p. 114, pl. xxxv. fig. 5; *Graptolithus bicornis*, Hall, 1848, p. 268, pl. lxxiii. fig. 2; genolectotype, *Prionotus pristis*, Hisinger (Gurley, 1896, p. 78). See note 3, p. 170.

DIPLOSPIROGRAPTUS, Ruedemann, 1925, p. 34; genotype, *D. goldringæ*, Ruedemann, 1925, p. 34, pl. vii. figs. 1–6.

Diprion, Barrande, 1850, pp. 15 & 18; genosyntypes, *Graptolithus* (*Diprion*) *palmeus*, Barrande, 1850, p. 59, pl. iii. figs. 1–7; *G.* (*Diprion*) *ovatus*, Barrande, 1850, p. 63, pl. iii. figs. 8, 9; genolectotype, *G.* (*Diprion*) *palmeus*, Barrande, here selected. The generic name is preoccupied, and the species mentioned are two of the four genosyntypes of *Petalograptus*, Suess, 1851, of which *Diprion*, Barrande, is consequently a synonym.

DISCOGRAPTUS, Wiman, 1901, p. 191; genotype, *D. schmidti*, Wiman, 1901, p. 191, pl. viii. figs. 1, 18.

DIVERSOGRAPTUS, Manck, 1923, p. 283; genosyntypes, *D. rectus*, Manck, 1923, p. 283; *D. ramosus*, Manck, 1923, p. 283; genolectotype, *D. ramosus*, Manck, here selected.

ETAGRAPTUS, Ruedemann, 1904, p. 644; genotype, *Tetragraptus* (*Etagraptus*) *lentus*, Ruedemann, 1904, p. 666, pl. ix. figs. 7–10. (Subgenus of *Tetragraptus*, Salter, 1863.)

GALEOGRAPTUS, Wiman, 1901, p. 189; genotype, *G. wennersteni*, Wiman, 1901, p. 189, pl. viii. figs. 8, 9.

Gladiograptus, Lapworth, 1875, p. 633, emend. Elles and Wood, 1908, p. 336; genotype, (*Gladiolites*) *Retiolites geinitzianus*, Barrande, 1850, p. 69, pl. iv. figs. 16–33. (Synonym of *Retiolites*, s. str.). See note 3, p. 170.

Gladiolites, Barrande, 1850, p. 68. See *Retiolites*, Barrande, 1850.

GLOSSOGRAPTUS, Emmons, 1855, p. 108; genotype, *G. ciliatus*, Emmons, 1855, p. 108, pl. i. fig. 25. ? Synonym, *Lonchograptus*, Tullberg, 1880.

GLYPTOGRAPTUS, Lapworth, 1873, p. 555 (table i.); genotype, *Diplograpsus tamariscus*, Nicholson, 1868 *a*, p. 526, pl. xix. figs. 10–13. (Stated to be "typical species" on p. 557.) (Subgenus of *Diplograptus*, M'Coy, 1850.)

GONIOGRAPTUS, M'Coy, 1876, p. 130; genotype, *Didymograpsus thureaui*, M'Coy, 1876, p. 129, text-fig.

GOTHOGRAPTUS, Frech, 1897, p. 670; genotype, *Retiolites nassa*, Holm, 1890, p. 25, pl. ii. figs. 12–14. (Subgenus of *Retiolites*, Barrande, 1850.)

Graptolithus, Linnæus, 1735, 1768, p. 173. Obsolete; see note 4 on p. 170.

Graptopora, Salter, 1857, p. 65; genotype, *G. socialis*, Salter, 1857=*Gorgonia flabelliformis*, Eichwald, 1840, p. 207. (Synonym of *Dictyonema*, Hall, 1851.)

HALLOGRAPTUS, Carruthers MS., Lapworth, 1877, p. 134; genotype, *Diplograpsus bimucronatus*, Nicholson, 1869, p. 236, pl. ix. fig. 12. (Subgenus of *Lasiograptus*, Lapworth, 1873.)

Helicograptus, Nicholson, 1868 *b*, p. 23; genotype, *Graptolithus gracilis*, Hall, 1848, p. 274, pl. lxxiv. fig. 6. This genus is a synonym of *Nemagraptus*, Emmons, 1855.

HOLOGRAPTUS, Holm, 1881 *a*, p. 45; genotype, *H. expansus*, Holm, 1881 *a*, p. 46, pl. xii. figs. 1, 2. (Synonym, *Rouvilligraptus*, Barrois, 1893.)

Idiograptus, Lapworth, 1880, p. 169; genotype, *I. aculeatus*, Lapworth, 1880, p. 170, pl. v. fig. 23. The genotype is referred by Elles and Wood, 1908, p. 317, to Hall's genus *Retiograptus*, of which *Idiograptus*, Lapworth, becomes a synonym.

INOCAULIS, Hall, 1851, p. 401 (1852, p. 176); genotype, *I. plumulosa*, Hall, 1851, p. 401 (nom. nud.), 1852, p. 176, pl. xl. G, fig. 2.

ISOGRAPTUS, Moberg, 1892, p. 345; genotype, *Didymograptus caduceus*, Salter (partim), 1853, p. 87, fig. 1=*Didymograptus gibberulus*, Nicholson, 1875, p. 271, pl. vii. fig. 3. (Subgenus of *Didymograptus*, M'Coy, 1851.)

Janograptus, Tullberg, 1880, p. 314; genotype, *J. laxatus*, Tullberg, 1880, p. 315, pl. xi. figs. 3–9. This genus is probably to be regarded as a synonym of *Didymograptus*, M'Coy, 1851.

KOREMAGRAPTUS, Bulman, 1927, p. 344; genotype, *K. onniensis*, Bulman, 1927, p. 346, pl. iv. figs. 1–5. According to the rules of transcription, this should be "*Coremagraptus*."

LASIOGRAPTUS, Lapworth, 1873, p. 559; genotype, *L. costatus*, Lapworth, 1873, p. 559.

LEPTOGRAPTUS, Lapworth, 1873, p. 558; genotype, *Graptolithus flaccidus*, Hall, 1865, p. 143, pl. ii. figs. 17–19.

Linograptus, Frech, 1897, p. 662; genotype, *Graptolithus nilssoni*, Barrande, 1850, p. 51, pl. ii. fig. 16. (Synonym of *Monograptus*, Geinitz, 1852.)

LOGANOGRAPTUS, Hall, 1868, p. 226; genotype, *Graptolithus logani*, Hall, 1858 *a*, p. 142, 1858 *b*, p. 115.

Lomatoceras, Bronn, 1835, p. 55; genotype, *L. priodon*, Bronn, 1835, p. 56, pl. i. fig. 13. See *Monograptus*, Geinitz, 1852, and note 5 on p. 170.

Lonchograptus, Tullberg, 1880, p. 313; genotype, *L. ovatus*, Tullberg, 1880, p. 314, pl. xi. figs. 1, 2. Probably a synonym of *Glossograptus*, Emmons.

MASTIGOGRAPTUS, Ruedemann, 1908, p. 210; genotype, *Dendrograptus tenuiramosus*, Walcott, 1879 (1883), p. 21.

MEANDROGRAPTUS, Moberg, 1892, p. 344; genotype, *M. schmalenseei*, Moberg, 1892, p. 344, pl. viii. figs. 8–10.

MEDUSÆGRAPTUS, Ruedemann, 1925, p. 29; genotype, *M. mirabilis*, Ruedemann, 1925, p. 32, pl. ix. figs. 1–6, pl. x. figs. 1–4, pl. xi. fig. 1.

Megalograptus, Miller, 1874, p. 343; genotype. *M. welchi*, Miller, 1874, p. 343, figs. 35–37. This is probably not a graptolite.

Mesograptus, Elles and Wood, 1907, p. 258; genotype, *Graptolithus foliaceus*, Murchison, 1839, p. 694, pl. xxvi. fig. 3. (Subgenus of *Diplograptus*, M'Coy, 1850, and apparently synonymous with *Diplograptus*, M'Coy, s. str.) See note 3, p. 170.

Monoclimacis, Frech, 1897, p. 621; genotype, *Graptolithus colonus*, Barrande, 1850, pl. ii. fig. 4 (cet. excl.) = *Graptolithus vomerinus*, Nicholson, 1872, pp. 52 & 53, fig. 21. (Synonym of *Monograptus*, Geinitz, 1852.)

MONOGRAPTUS, Geinitz, 1852 *a*, p. 32, and 1852 *b*, p. 389, emend. auct. and Elles and Wood, 1911, p. 359; genosyntypes, 28 species. *Lomatoceras priodon*, Bronn, 1835, p. 56, pl. i. fig. 13 (cited as *Graptolithus priodon*, Gein., by Bronn, 1848, p. 551), was considered by Geinitz (1852 *a*, p. 43) to have been the species on which the characters of *Monoprion*, Barrande, 1850, were founded. This species was given as "example" of *Monograptus* by Lapworth, 1873, p. 555 (table i.), but does not appear to have been the stated type until Bassler, 1915, p. 822, so named it. For discussion of synonymy, see note 5 on p. 170. Synonyms, *Demirastrites*, Eisel, 1912; *Linograptus*, Frech, 1897; *Lomatoceras*, Bronn, 1835; *Monoclimacis*, Frech, 1897; *Monoprion*, Barrande, 1850; *Pomatograptus*, Jaekel, 1889; *Pristiograptus*, Jaekel, 1889; *Spirograptus*, Gürich, 1908.

Monoprion, Barrande, 1850, p. 15; 14 genosyntypes. See *Monograptus*, Geinitz, 1852, and note 5 on p. 170.

Nanograptus, Hadding, 1915, p. 328; genosyntypes, *Nanograptus lapworthi*, Hadding, 1915, p. 329, pl. vi. figs. 1–9; *Petalograptus* (?) *phylloides*, Elles and Wood, 1908, p. 284, pl. xxxii. fig. 16; genolectotype, *N. lapworthi*, Hadding (Hadding, in litt., Feb. 1929, here first published).

Nemagraptus, Emmons, 1855, p. 109; genosyntypes, *Nemagrapsus elegans*, Emmons, 1855, p. 109, pl. i. fig. 6; *N. capillaris*, Emmons, 1855, p. 109, pl. i. fig. 7; genolectotype, *N. elegans*. Emmons, 1855=*Graptolithus gracilis*, Hall, 1848, p. 274, pl. lxxiv. fig. 6 (Hall, 1868, p. 211). Synonyms, *Cœnograptus*, Hall, 1868 (partim); *Helicograpsus*, Nicholson, 1868; *Stephanograpsus*, Geinitz, 1866.

Nereograpsus, Geinitz, 1852 *a*, p. 27; the name was given as a comprehensive term for a number of genera, none of which is now believed to be a graptolite.

Neurograptus, Lapworth, 1875, p. 641 (nom. nud.), Elles and Wood, 1908, p. 331; genosyntypes, *Retiolites fibratus*, Lapworth, 1876 *a*, pl. iii. fig. 62; *Lasiograptus margaritatus*, Lapworth, 1876 *a*, pl. ii. fig. 60; genolectotype, *L. margaritatus*, Lapworth, here chosen with the consent of Dr. G. L. Elles. (Subgenus of *Lasiograptus*, Lapworth, 1873.)

Nymphograptus, Lapworth MS., Elles and Wood, 1908, p. 329; genotype, *N. velatus*, Elles and Wood, 1908, p. 329, pl. xxxiv. fig. 4. (Subgenus of *Lasiograptus*, Lapworth, 1873.)

Odontocaulis, Lapworth, 1881, p. 176; genotype, *O. keepingi*, Lapworth, 1881, p. 176, pl. vii. fig. 7. (Synonym of *Callograptus*, Hall, 1865.)

Oncograptus, T. S. Hall, 1914, p. 109; genotype, *O. upsilon*, T. S. Hall, 1914, p. 109, pl. xvii. fig. 14. Possibly best regarded as a subgenus of *Didymograptus*, M'Coy.

Orthograptus, Lapworth, 1873, table i. p. 559; genotype, *Graptolithus quadrimucronatus*, Hall, 1865, p. 144, pl. xiii. figs. 1–10. (Stated to be "typical species" on p. 557.) (Subgenus of *Diplograptus*, M'Coy, 1850.)

Palæodictyota, Whitfield, 1902, p. 399, emend. Ruedemann, 1908, p. 198; genotype, *Inocaulis anastomotica*, Ringueberg, 1888, p. 131, pl. vii. fig. 2. The genotype was considered by Whitfield to be a synonym of *Inocaulis ramulosus*, Spencer, 1884 *a*, p. 38, pl. vi. fig. 1, but the synonymy was not accepted by Ruedemann in 1908 (p. 199).

Petalograptus, Suess, 1851, p. 100; genosyntypes, *Graptolithus palmeus*, Barrande, 1850, p. 59, pl. iii. figs. 1–7; *Petalolithus parallelo-costatus*, Suess, 1851, p. 105, pl. viii. fig. 2; *Prionotus folium*, Hisinger, 1837, p. 114, pl. xxxv. fig. 8;

Graptolithus ovatus, Barrande, 1850, p. 63, pl. iii. figs. 8, 9; genolectotype, *P. folium*, Hisinger (Lapworth, 1873, table i. pp. 555 & 557). The original name, *Petalolithus*, of Suess, has been changed by later authors to *Petalograptus*, but the sense in which it was used remains unaltered. It is reckoned a subgenus of *Diplograptus*, M'Coy, 1850. (Synonym, *Diprion*, Barrande, 1850.)

Phycograptus, Gurley, 1896, p. 89; genotype, *P. brachymera*, Gurley, 1896, p. 89, pl. v. fig. 6. This is not now regarded as a graptolite.

Phyllograpta, Angelin, 1854, p. iv; genotype, *Gorgonia flabelliformis*, Eichwald, 1840, p. 207; synonym of *Dictyonema*, Hall, 1851.

PHYLLOGRAPTUS, Hall, 1858 *b*, p. 135; genosyntypes, *P. typus*, Hall, 1858 *b*, p. 137; *P. ilicifolius*, Hall, 1858 *b*, p. 139; *P. angustifolius*, Hall, 1858 *b*, p. 139; *P. similis*, Hall, 1858 *b*, p. 140; genolectotype, *P. typus*, Hall, 1858 (Miller, 1889, p. 200, and "type by original designation" of Art. 30, I, *b*). (? Synonym, *Cardiograptus*, Harris and Keble.)

Plectograptus, Moberg and Törnquist, 1909, p. 18; genotype, *Retiolites macilentus*, Törnquist, 1887, p. 491. The genus appears to be a synonym of *Plegmatograptus*, Elles and Wood, 1908 (of which "cfr. *Retiolites macilentus*" is one of the genosyntypes).

PLEGMATOGRAPTUS, Elles and Wood, 1908, p. 340; genosyntypes, *Retiolites* (*Plegmatograptus*) *nebula*, Elles and Wood, 1908, p. 340, pl. xxxiv. fig. 14; *Retiolites perlatus*, var. *obesus*, Lapworth, 1877, p. 137, pl. vi. fig. 29 (=*Retiolites* (*Plegmatograptus*) *obesus* (Lapworth)); cfr. *Retiolites macilentus*, Törnquist, 1887, p. 491, fig. 3 (=*Retiolites* (*Plegmatograptus*) *obesus*, var. cfr. *macilentus* (Törnquist); genolectotype, *R.* (*P.*) *nebula*, Elles and Wood, here chosen with the consent of Dr. G. L. Elles. (? Synonym, *Plectograptus*, Mbg. & Törnq.) Subgenus of *Retiolites*, Barrande, 1850.

PLEUROGRAPTUS, Nicholson, 1867, p. 257; genotype, *Cladograpsus linearis*, Carruthers, 1858, p. 467, fig. 1. (Synonym, *Cladograpsus*, Carruthers, 1858.)

Pomatograptus, Jaekel, 1889, p. 677; genosyntypes, *Lomatoceras priodon*, Bronn, 1835, p. 56, pl. i. fig. 13; *Pomatograptus micropoma*, Jaekel, 1889, p. 684, pl. xxix. figs. 4–6; *Graptolithus becki*, Barrande, 1850, p. 50, pl. iii. fig. 14; *Graptolithus barrandei*, Suess, 1851, p. 126, pl. ix. fig. 12. *L. priodon*, Bronn, is here selected as genolectotype, and the genus becomes a synonym of *Monograptus*, Geinitz, 1852.

Priodon, Nilsson MS. c. 1830; *Prionotus*, Nilsson MS., Hisinger, 1837, p. 113. Obsolete; see note 6 on p. 171.

Pristiograptus, Jaekel, 1889, p. 667; genotype, *Pristiograptus frequens*, Jaekel, 1889, p. 669, pl. xxviii. figs. 1, 2 (the species is stated to be typical for the genus on p. 670). (Synonym of *Monograptus*, Geinitz, 1852.)

PROTISTOGRAPTUS, McLearn, 1915, p. 55; genosyntypes, *Cyrtotheca minuta*, Matthew, 1892, p. viii; *Cyrtotheca corrugata*, Matthew, 1892, p. viii; genolectotype, *C. corrugata*, Matthew (McLearn, in litt., Feb. 1929, here first published).

Protograptus, Matthew, 1885, p. 31; genotype, *P. alatus*, Matthew, 1885, p. 32, pl. v. fig. 6. This is almost certainly not a graptolite.

Protovirgularia, M'Coy, 1850, p. 272; genotype, *P. dichotoma*, M'Coy, 1850, p. 272. This genus is not accepted as a graptolite.

PTEROGRAPTUS, Holm, 1881 *b*, p. 71; genotype, *Graptolithus gracilis*, Kjerulf, 1865 (non Hall, 1848) = *Pterograptus elegans*, Holm, 1881 *b*, p. 77.

PTILOGRAPTUS, Hall, 1865, p. 139; genosyntypes, *P. plumosus*, Hall, 1865, p. 140, pl. xxi. figs. 1–4; *P. geinitzianus*, Hall, 1865, p. 140, pl. xxi. figs. 5–8; genolectotype, *P. plumosus*, Hall, 1865 (Miller, 1889, p. 201).

PTIOGRAPTUS, Ruedemann, 1908, p. 175; genotype, *P. percorrugatus*, Ruedemann, 1908, p. 176, pl. v. fig. 6.

RASTRITES, Barrande, 1850, p. 64; genosyntypes, *R. linnæi*, Barrande, 1850, p. 65, pl. iv. figs. 2–4; *R. fugax*, Barrande, 1850, p. 66, pl. iv. fig. 1; *R. peregrinus*, Barrande, 1850, p. 67, pl. iv. fig. 6; *R. gemmatus*, Barrande, 1850, p. 68, pl. iv. fig. 5; genolectotype, *R. peregrinus*, Barrande, 1850 (Miller, 1889, p. 202). (Subgenus of *Monograptus*, Geinitz.)

RETICULOGRAPTUS, Wiman, 1901, p. 189; genotype, *Dictyonema tuberosum*, Wiman, 1895, p. 53, pl. xii. figs. 9, 12; pl. xiv. figs. 1–8.

RETIOGRAPTUS, Hall, 1859, p. 518; genotype, *R. geinitzianus*, Hall, 1859, p. 518. Synonyms, *Clathrograptus*, Lapworth, 1873; *Idiograptus*, Lapworth, 1880.

RETIOLITES, Barrande, 1850, p. 68; genotype, *Graptolithus* (*Retiolites*) *geinitzianus*, Barrande, 1850, p. 69, pl. iv. figs. 16–33. This is an alternative name for *Gladiolites*, Barrande, 1850, suggested by Barrande in case *Gladiolites* was not considered sufficiently distinct from *Gladiolus* (since at that time a fossil *Gladiolus* would have been named *Gladiolites*). *Retiolites* has been used, almost without exception, by all writers since Suess (1851, p. 91).

Rhabdinopora, Eichwald, 1855, p. 453; genotype, *Gorgonia* *flabelliformis*, Eichwald, 1840, p. 207; synonym of *Dictyonema*, Hall, 1851.

RHIZOGRAPTUS, Spencer, 1878, p. 460; genotype, *R. bulbosus*, Spencer, 1878, p. 460.

RHODONOGRAPTUS, Pocta, 1894, p. 204; genotype, *R. astericus*, Pocta, 1894, p. 206, pl. v. figs. 5–11. Referable to the Graptolithina with some doubt.

Rouvilligraptus, Barrois, 1893, p. 109; genotype, *Graptolithus richardsoni*, Hall, 1865, p. 107, pl. xii. figs. 1, 8. (Synonym of *Holograptus*, Holm, 1881.)

SCHIZOGRAPTUS, Nicholson, 1876, p. 248; genotype, *Dichograptus reticulatus*, Nicholson, 1868 *a*, p. 143, pl. v. figs. 4, 5.

SIGMAGRAPTUS, Ruedemann, 1904, p. 701; genotype, *S. præcursor*, Ruedemann, 1904, p. 702, pl. v. figs. 13, 14.

Spirograptus, Gürich, 1908, p. 34; genosyntypes, *Graptolithus turriculatus*, Barrande, 1850, p. 56, pl. iv. figs. 7–11; *Monograptus spiralis*, var. *subconicus*, Törnquist, 1879, p. 455; genolectotype, *Graptolithus turriculatus*, Barrande, 1850, is here selected, and the genus is regarded as a synonym of *Monograptus*, Geinitz.

STAUROGRAPTUS, Emmons, 1855, p. 108; genotype, *S. dichotomous*, Emmons, 1855, p. 109, pl. i. fig. 21.

Stephanograptus, Geinitz, 1866, p. 124; genotype, *Graptolithus gracilis*, Hall, 1848, p. 274, pl. lxxiv. fig. 6. (Synonym of *Nemagraptus*, Emmons, 1855.)

STOMATOGRAPTUS, Tullberg, 1883, p. 42; genotype, *S. törnquisti*, Tullberg, 1883, p. 42, pl. i. figs. 1–8 = *Retiolites grandis*, Suess, 1851, p. 99, pl. vii. fig. 2 (Törnquist, 1890, p. 8).

STROPHOGRAPTUS, Ruedemann, 1904, p. 716; genotype, *S. trichomanes*, Ruedemann, 1904, p. 717, pl. iv. figs. 17–20.

SYNDYOGRAPTUS, Ruedemann, 1908, p. 266; genotype, *S. pecten*, Ruedemann, 1908, p. 267, pl. xv. figs. 5, 6.

SYRRHIPIDOGRAPTUS, Poulsen, 1924, p. 1; genotype, *S. nathorsti*, Poulsen, 1924, p. 2.

TEMNOGRAPTUS, Nicholson, 1876, p. 248; genotype, *Dichograptus multiplex*, Nicholson, 1868 *a*, p. 129, pl. vi. figs. 1–3.

TETRAGRAPTUS, Salter, 1863, p. 140; genotype, *Graptolithus bryonoides*, Hall, 1858 *a*, p. 150, 1858 *b*, p. 126 = *Fucoides serra*, Brongniart, 1828, p. 71, pl. vi. figs. 7, 8. See note 7 on p. 171.

THALLOGRAPTUS, Ruedemann, 1925, p. 35; genotype, *Dendrograptus? succulentus*, Ruedemann, 1904, p. 581, pl. iv. figs. 1–4.

Thallograptus, Öpik, 1928, p. 35; genotype, *T. sphæricola*, Öpik, 1928, p. 39, pl. iii. figs. 16–18, pl. iv. fig. 2, text-fig. 7 *a*. The name is preoccupied, but the genus appears to be a synonym of *Chaunograptus*, Hall, 1882.

THAMNOGRAPTUS, Hall, 1859, p. 519: genosyntypes, *T. typus*, Hall, 1859, p. 519; *T. capillaris*, Hall, 1859, p. 520. It should be noted that *T. typus* is "type by original designation" of Art. 30, I. *b*, but Ruedemann states (1908, p. 206) that both genosyntypes are synonyms of *Nemagrapsus capillaris*, Emmons, 1855, p. 109. (Synonym, *Birastrites*, Geinitz, 1866 partim.)

Thysanograptus, Elles and Wood, 1908, p. 325; genotype, *Diplograptus harknessi*, Nicholson, 1867, p. 262, pl. xi. fig. 6. (Synonym of *Lasiograptus*, Lapworth, 1873, s. str.)

TRIÆNOGRAPTUS, T. S. Hall, 1914, p. 115; genotype, *T. neglectus*, T. S. Hall, 1914, p. 115, fig. 7.

TRICHOGRAPTUS, Nicholson, 1876, p. 248; genotype, *Dichograptus fragilis*, Nicholson, 1869, p. 232, pl. xi. figs. 1–3.

TRIGONOGRAPTUS, Nicholson, 1869, p. 231; genotype, *T. lanceolatus*, Nicholson, 1869, p. 232, pl. xi. fig. 6.

TRIOGRAPTUS, Monsen, 1925, p. 168; genotype, *T. osloensis*, Monsen, 1925, p. 168, pl. iii. figs. 1–12, pl. iv. figs. 1–3.

Triplograptus, Richter, 1871, p. 251; genotype, (?) *Cladograpsus nereitarum*, Richter, 1853, p. 450, pl. xii. figs. 1, 2. This genus is not now accepted as a graptolite.

TROCHOGRAPTUS, Holm, 1881 *a*, p. 48; genotype, *T. diffusus*, Holm, 1881 *a*, p. 49, pl. xii. figs. 3–6, pl. xiii.

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XVI.—*New and little-known African* Delphacidæ (*Homoptera, Fulgoroidea*) *in the Collection of the British Museum.*

By F. Muir, Hawaiian Sugar Planters' Experiment Station, Honolulu, T.H.

The majority of the material dealt with in this paper was collected by Mr. R. E. Turner, and I have therefore refrained from repeating his name after every locality, only quoting the name of the collector in those few cases where specimens were collected by someone else. Most of the material was received from the British Museum, where all the types are preserved; a lesser amount through the Imperial Bureau of Entomology.

This occasion has been taken to list all the Delphacidæ so far reported from Africa. There may be a few omissions, especially of Palæarctic forms occurring in North Africa, but a fair idea is given of our present knowledge of this family in Africa, and the list should be a help to future workers.

The most interesting feature about African Delphacidæ is the absence of the Asiracinæ. This subfamily contains the most primitive forms of the family, and is represented by some fourteen genera and numerous species distributed over the Americas, Asia, Malaysia, Australia, New Zealand, the South Pacific Islands, and even the Seychelle Islands. But the fact that only 22 genera and 67 species of Delphacidæ are so far known from Africa indicates that it is premature to draw any conclusions from their absence.

The absence of any Palæarctic forms in the region, except those that are cosmopolitan, also is remarkable. The discovery of *Embolophora monoceros* on the White Nile greatly extends the distribution of this species, as hitherto it was only known from South Africa; it would be of interest to know the food-plant, especially if this should prove to be any of the Euphorbias. The Asiracinæ and the Alohini are mainly attached to trees and bushes, and none are widely distributed, whereas many Tropidocephalini and Delphacini are attached to grasses, and some are very widely distributed.

Having examined large collections of Delphacidæ from all the chief geographical areas it is of interest to note certain characteristics. They form a very uniform family characterized by the presence of a mobile spur on the hind tibia. Without this spur most, if not all, of the genera would be placed in the Cixiidæ. If we ignore the male genitalia the specific differences are slight or very slight in many of the genera, but if we compare the male genitalia the differences are then generally so great that the difficulty is to understand what relationship many hold to one another. Leaving the question of the utility of the differences in the genitalia out of consideration, it is impossible to conceive any survival value in the specific characters, and even most of the generic characters cannot be shown to be of survival value. The spur on the hind tibia and its four forms, which distinguish the family and its chief divisions, may play an important part in the economy of the family, but we cannot state what it is. An extensive study of the death factors acting on certain species over a large part of the Pacific area has demonstrated that they fall mainly upon the eggs and the nymphs, leaving but a very small number of adults to be acted upon by natural selection. This may have some bearing upon the nature of the specific characters.

There is a tendency in several genera towards the lengthening of the head, which is carried to an extreme extent in a few cases (e. g., *Embolophora*). Kershaw has shown that this elongated head is filled with a diverticulum from the crop, as in many other of the Fulgoroidea. In some cases diverticula from the crop penetrate into the legs. This enlargement of part of the alimentary tract is evidently connected with the nature of the food, and so the enlarged head may be an adaptation to give more room. Among the Cicadoidea and Sternorhynchi the "filter" also appears to be an adaptation to the nature of the food.

In whatever order we arrange the genera of this family it has to be admitted that there are a number of cases of parallel development in the generic characters, such as the widening and flattening of one or two segments of the antennæ, the single and double frontal carinæ, the shape of the lateral pronotal carinæ, the flattening and widening of the legs, and certain colour-patterns on the tegmina.

Many species live upon cultivated plants, especially grasses, and were it not for the effective parasites which keep them in check they would be of great economic importance. This is demonstrated by one species (*Perkinsiella saccharicida*, Kirk.), introduced into Hawaii without its parasites, which increased to such numbers as to threaten the whole of the sugar industry of the islands. This species has since been controlled by introducing parasites from Australia, Fiji, and other places. A West Indian species (*Saccharosydne saccharivora*, West.) has been reported as numerous and harmful on a few occasions, but normally it is not so. It is probable that climatic conditions at times destroy many of the small egg-parasites, and then the insect increases for a short time, to be eventually reduced by the parasites as they regain their normal proportion. It was a local increase which brought *Perkinsiella vastatrix* (Bredd.) to notice in Java when it was first recorded and described, but since then it has never been recognized as a harmful insect, and I never found it plentiful in any locality in which I studied it.

Chloriona and *Sogata* are difficult to keep distinct, and may eventually have to be regarded as one genus. In that case it may be necessary to use the generic name of *Liburnia*, Stål. It is certainly synonymous with one, but which one I am not quite sure.

DELPHACINÆ.

ALOHINI.

1. HAPLOMELUS, Stål.

1. *Haplomelus flavipes*, Stål.

Haplomelus flavipes, Stål, Öfv. Vet.-Ak. Förh. p. 265 (1853).
Gadora capensis, Walker, Cat. Hom. Supp. p. 84 (1858).
Cixius incerta, Sign., in Thomson, Arch. Ent. ii. pl. 9. fig. 10 (1858) (no description).

One male and two females from Port St. John, Pondoland (iii., iv. 1923), and one male from Njala, Sierra Leone (*H. Hargreaves*, 21. xi. 1926). Hitherto this species had only been reported from Natal. In the South African specimens the wings are absent or rudimentary and the tegmina long and distinctly narrowed at the node, whereas the Sierra Leone specimen has normal wings and the tegmina are not narrowed at the node.

TROPIDOCEPHALINI.

2. EURYSA, Fieber.

2. *Eurysa turneri* (Muir).

Columbiana turneri, Muir, Ann. & Mag. Nat. Hist. (9) xvii. p. 19, figs. 4, 5 (1926).

One male and ten females from Pondoland, Port St. John (vi. 1923), and Natal, Van Reenans (xi., xii. 1926 and i. (1927).

Upon reconsideration I have placed this with other closely allied species in *Eurysa*. The female is similar in build and colour to the male. The pygofer and eighth sternite are lighter than the rest of the abdomen; the anal style is black or very dark brown. There is a tendency for the middle of the mesonotum to be lighter than the rest.

3. *Eurysa nigrocacuminis*, Muir.

Eurysa nigrocacuminis, Muir, Ann. & Mag. Nat. Hist. (9) xvii. p. 22, figs. 11, 12 (1926).

Two brachypterous males and four brachypterous females from Pondoland, Port St. John. There are also two macropterous males from Zululand, Melmoth. The tegmina are hyaline, very slightly stramineous, the veins before the nodal line are light, beyond the nodal line dark, there is no dark area at the apex in these brachypterous forms. The height of the armature of the diaphragm is also less than in the type-specimen. In this and allied species there is a membranous area on each lateral margin which allows the pygofer to partly close up longitudinally, so that the ventral margin is drawn towards the anal segment which is not well shown in the figure.

4. *Eurysa semifrons*, sp. n.

Macropterous Male.—Length 2 mm.; tegmen 2·7 mm.

Head about as broad as thorax. Vertex wider than long, base 1·5 times the length in middle; base in front of the middle of eyes, apex slightly rounded, projecting slightly in front of eyes; length of frons twice the width. Antennæ reaching to near middle of clypeus, first segment longer than wide, second considerably longer than first. Hind tarsi about as long as hind tibiæ, hind basitarsus about as long as other two segments together; spur not quite so long as basitarsus, wide, tectiform, fairly thick, without teeth on hind margin.

Opening of pygofer wider than long, margins entire; anal emargination wide, anal angles obscure; dorsal margin of diaphragm slightly produced, rounded. Anal segment with two small curved spines on ventral aspect. Ædeagus thin, tubular, slightly flattened, a row of minute teeth along the apical portion on left side. Genital styles in shape similar to those of *E. furcifera*, but the outer prong wider and the inner prong comparatively smaller.

Dark shiny brown or black; apical half of frons, genæ, the lateral margins of the pronotum white or creamy white; apex of front femur, posterior angle of mesonotum, pleura of abdomen light, tibiæ with longitudinal light and dark lines. Tegmina hyaline, clear, apical veins and apical margin dark brown, other veins lighter brown. Wings hyaline, clear, veins brown.

Hab. Cape Town, Milnerton (xii. 1925).

Described from two male specimens.

5. *Eurysa furcifera*, Muir.

Eurysa furcifera, Muir, Ann. & Mag. Nat. Hist. (9) xvii. p. 20, figs. 7, 8 (1926).

Cape Province, Aliwal North.

6. *Eurysa pullata*, Muir.

Eurysa pullata, Muir, Ann. & Mag. Nat. Hist. (9) xvii. p. 20, figs. 9, 10 (1926).

Cape Province, Mossel Bay.

7. *Eurysa atrata*, Muir.

Eurysa atrata, Muir, Ann. & Mag. Nat. Hist. (9) xvii. p. 22, figs. 13, 14 (1926).

3. TROPIDOCEPHALA, Stål.

8. *Tropidocephala flaviceps*, Stål.

Tropidocephala flaviceps, Stål, Öfv. Vet.-Ak. Förh. p. 93 (1855); Muir, Ann. & Mag. Nat. Hist. (9) xvii. p. 17, figs. 1, 2 (1926).

Caffraria; Natal, Weenen.

9. *Tropidocephala brunnipennis*, Sign.

Tropidocephala brunnipennis, Sign., Ann. Soc. Ent. Fr. (3) viii. p. 185. 18, pl. 5. fig. 2 (1860).
Conicoda graminea, Matsumura, Ent. Nachtr. xxvi. p. 259 (1900).
Ectopiopterygodelphax eximus, Kirkaldy, Haw. Sugar Ptrs. Ent. Bull. i. p. 412 (1906).
Tropidocephala philippina, Melichar, Phil. Jour. Sci. D. ix. p. 273 (1914).

Widely distributed in Asia, Australia, Malay Islands, and Africa.

10. *Tropidocephala elegans* (Costa).

Fulgora elegans, Costa, Annuario Zool. p. 82. 12 (1840).
Delphax tuberipennis, Mulsant & Rey, Ann. Soc. Lin. Soc. Lyon. p. 199 (1855).

Nephropsia elegans (Costa), Costa, Ann. Mus. Zool. Nap. i. p. 77, pl. 2. figs. 12–15 (1862).
Tropidocephala elegans (Costa), Fieber, Rev. Mag. Zool. (3) vi. p. 276. 1 (1878).

Widely distributed over South Europe and North Africa.

11. *Tropidocephala incompta*, Muir.

Tropidocephala incompta, Muir, Ann. & Mag. Nat. Hist. (9) xvii. p. 18, figs. 3, 4 (1926).

West Africa, Sierra Leone.

DELPHACINI.

4. PERKINSIELLA, Kirkaldy.

12. *Perkinsiella saccharicida*, Kirkaldy.

Perkinsiella saccharicida, Kirkaldy, Entomologist, xxxvi. p. 179 (1903).

One female specimen from Zululand, Eshowe (iii. 1926). This species has been recorded from Natal; it is widely distributed, occurring in the Hawaiian Islands, Australia, Java, Malay States, Fiji, and Mauritius.

Perkinsiella is a Pacific genus, and this species has evidently been carried with its food-plant, sugar-cane, in the egg state. In that manner it was introduced from Australia to Hawaii, where it did great harm to the sugar industry till parasites were introduced from Fiji and Australia which now control it.

Perkinsiella vastatrix (Bredd.) was reported by Melichar from East Africa, Tanga, but I cannot accept the identification without further evidence.

5. AMBLYCOTIS, Stål.

13. *Amblycotis laticeps*, Stål.

Amblycotis laticeps, Stål, Öfv. Vet.-Ak. Förh. p. 98. 1 (1855).

Eleven males and six females from Pondoland, Port St. John. The males are all macropterous, with the apical veins of the tegmina fuscous and the rest of the veins with dark granules; the females are all brachypterous, with the apices of the apical veins with small marks and without any dark granules, or with only very faint ones.

Originally recorded from Cape Colony.

6. BOSTÆRA, Ball.

14. *Bostæra* sp.

There is one female from Natal, Van Reenen (i. 1927), which can be placed in this genus, although the antennæ are not so flattened as in the type-species. As it is not a very good specimen, I refrain from describing it until more material can be examined.

7. EMBOLOPHORA, Stål.

15. *Embolophora monoceros*, Stål.

Embolophora monoceros, Stål, Öfv. Vet.-Ak. Förh. p. 92 (1855); Muir, Ann. & Mag. Nat. Hist. (9) xvii. p. 23, fig. 16 (1926).

Thirteen specimens from Zululand, Eshowe, Lower Umhlatuzi and Mtunzin (*R. E. Turner*), and one specimen from Natal, Umbilò (*A. L. Bevis*). In the Hope collection at the University Museum, Oxford, there is one female specimen from the White Nile, Hillet Nuer, latitude 8° 13′ N., collected by G. B. Longstaff, no. 1391. This is the first record outside of South Africa.

8. RHINOTETTIX, Stål.

16. *Rhinotettix fuscipennis*, Stål.

Rhinotettix fuscipennis, Stål, Öfv. Vet.-Ak. Förh. p. 93 (1855); Muir, Ann. & Mag. Nat. Hist. (9) xvii. p. 23, figs. 17–18 (1926).

Cape Colony; Little Namaqualand; Transvaal; Barberton. Originally from Caffraria.

9. CURTOMETOPUM, Muir.

17. *Curtometopum turneri*, Muir.

Curtometotum turneri, Muir, Ann. & Mag. Nat. Hist. (9) xvii. p. 26, figs. 22, 23 (1926).

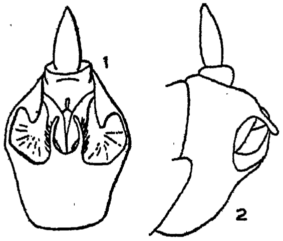
One female specimen from Transkei, Umtata (iii. 1923). Previously reported from Pondoland.

10. PHYLLODINUS, Van Duzee.

18. *Phyllodinus albofasciata*, sp. n. (Figs. 1, 2.)

Brachypterous Male.—Length 2·6 mm.; tegmen 1·5 mm. Head nearly as wide as the thorax. Width at the base of the vertex greater than the length and greater than the width at apex; base well behind the middle of the eyes, apex only very slightly projecting beyond the eyes, carinæ obscure. Length of frons 1·7 times the width, sides arcuate, narrowest at base, a concavity running across frons just below the eyes. Carinæ obscure, but a fork to the median carina can be made out reaching to near the middle of the frons. Antennæ reaching to the middle of the clypeus, second segment slightly longer than first. First and second tibiæ and femora flattened and widened; hind basitarsus longer than the other two segments together; spur not so long as the basitarsus, thin, tectiform, with many minute teeth on hind margin. There is one supplementary vein in the tegmen arising from the base of $Sc+R$.

Head, pronotum, and antennæ shiny dark brown, darkest on clypeus; mesonotum and a narrow posterior margin of pronotum yellowish or white, the lateral areas of pronotum dark, the apical angle of mesonotum dark; pleura and legs dark shiny brown or nearly black; metanotum yellowish; abdomen dark shiny brown with a yellowish mark in the middle of the seventh and eighth tergites. The base and apical cells of the tegmina shiny black, the middle portion forming a whitish band; veins the same colour as membrane.



Phyllodinus albofasciata.

Fig. 1.—Full view of pygofer.
Fig. 2.—Lateral view of pygofer.

The male genitalia figured, the ædeagus not dissected. The medio-ventral margin produced into two large, slightly curved processes; the anal angles produced and curved inward and downward; the genital styles obscure, unless dissected out.

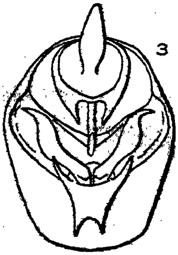
Macropterous Female.—Length 2·9 mm.; tegmen 3·3 mm. In build and in the colour of the head and body similar to the male, the abdomen being dark brown or nearly black. The tegmina are hyaline, the base dark brown reaching about halfway up the clavus and continued as lighter brown over the rest of the clavus; a crescent-shape brown mark from the node, over the nodal line, and along the margin to apex, another brown mark over the $Sc+R$ apical cell, broad on the margin but narrowing as it reaches the nodal line and joins the crescent-shape mark; veins the same colour as the membrane, granules very small and inconspicuous. Wings hyaline, clear, veins yellowish. This female agrees so well in build and colour of body with the male that it is highly probable it is the same species.

Hab. Zululand, Mtunzini, one male (vi. 1926), and Natal, Van Reenen, one female (i. 1927).

19. *Phyllodinus badius*, Muir. (Fig. 3.)

Phyllodinus badius, Muir, Bull. Ent. Res. x. p. 144 (1920).

Nigeria.



Phyllodinus badius.
Full view of pygofer.

20. *Phyllodinus evansi*, sp. n.

Macropterous Female.—Length 2·8 mm.; tegmen 3·8 mm. Head wide, about as wide as thorax; vertex a little broader than long, base slightly wider than apex, carinæ distinct. Antennæ reaching beyond the middle of clypeus, the two segments subequal in length. Carinæ of frons distinct, median carina furcate about middle. Front femora and tibiæ flattened, expanded, middle legs much less so. Venation of tegmina normal, no supplementary vein.

Brown; genæ below or behind transverse carina, the lateral portion of pronotum and the tegulæ light brown or yellow; the carinæ of vertex, frons, and thorax lighter with some light dots on frons. Apical cells of tegmina fuscous or brown, three hyaline marks on margin, the largest from node to *R*, the second between *R* and *M* 1, and the third between *R* 1 and 2, the veins being slightly darker; the apex of *Sc* runs across the first light mark and is white with four brown spots. Basad of the nodal line the tegmina are light brown, darker along the borders of the veins, which are white with dark brown granules bearing dark hairs. Wings hyaline, slightly fuscous with brown veins.

Hab. Gold Coast (*A. E. Evans,* 1913). Description based on one female. This differs from *P. badius* in having the granules of the veins dark and the light mark in apical area smaller.

21. *Phyllodinus punctovenosa* (Melichar).

Asiracina punctovenosa, Melichar, Ergeb. Zweit. Deutsch Zentr. Afr. Exped. i. p. 133, pl. ii. fig. 11 (1914).

I cannot separate Melichar's genus from *Phyllodinus.* The species was based on specimens from the Belgian Congo.

11. NILAPARVATA, Distant.

22. *Nilaparvata nigritarsis,* Muir.

Nilaparvata nigritarsis, Muir, Ann. & Mag. Nat. Hist. (9) xvii. p. 30, fig. 29 (1917).

Recorded from Natal, Weenen.

12. NATALIANA, Muir.

23. *Nataliana lineata,* Muir.

Nataliana lineata, Muir, Ann. & Mag. Nat. Hist. (9) xvii. p. 25, figs. 19, 20, 21 (1926).

Recorded from Port Natal.

13. STENOCRANUS, Fieber.

24. *Stenocranus* (?) *distinctus,* sp. n. (Figs. 4, 5.)

Macropterous Male.—Length 2 mm.; tegmen 2·7 mm.

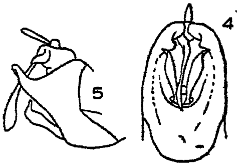
Length of vertex twice the width, base considerably behind middle of eyes, apex rounded, projecting well in front of middle of eyes; Y carina obscure; length of frons 2·5 times the width, middle slightly wider than base and apex, sides very slightly arcuate, median carina simple. Antennæ slightly longer than frons, first segment considerably longer than broad, second segment 2·5 times the length of first. Lateral pronotal carinæ diverging posteriorly, not reaching beyond middle. Mesonotum shorter than head and pronotum together, tricarinate. Hind basitarsus longer than other two segments together; spur not as long as basitarsus, thin, tectiform, with many very fine teeth along the hind margin. Tegmina long, narrow, *R* and *M* 1+2 touching for a short distance. Wing reaching nearly to apex of tegmina.

Genitalia figured. The anal segment has a very distinct armature in the shape of two very asymmetrical processes, that on the right small, flat, curved, that on the left long, flat, narrow, slightly expanded on apical half, reaching below the ventral margin of the opening of the pygofer; the anal angles of pygofer large, curved inwards and meeting together on the middle line or nearly doing so.

Stramineous; a thin black line from base to apex of antennæ. Tegmina hyaline, stramineous, veins same colour; wings light, stramineous, with darker veins.

Macropterous Female.—Length 2·3 mm.; tegmen 2·8 mm. Similar in general build and colour to the male. Ovipositor-sheath narrow. In the brachypterous forms the tegmina are normal in length, but much narrower, and the wings are rudimentary or absent.

Hab. Zululand, Eshowe (v., vi., vii. 1926); Natal, Kloof (viii. 1926).



Stenocranus distinctus.

Fig. 4.—Full view of pygofer.
Fig. 5.—Lateral view of pygofer.

Description based on nine males and three females.

The length of the basal antennal segment prevents *S. distinctus* from being included amongst the typical species of *Stenocranus*; it appears to be intermediate in structure between that genus and *Nataliana*, but for the time being it is best referred to *Stenocranus*.

14. Eumetopina, Breddin.

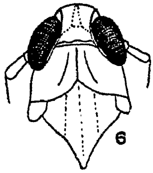
25. *Eumetopina straminea*, sp. n. (Figs. 6, 7.)

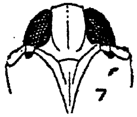
Male.—Length 3 mm.; tegmen 3·3 mm.

The head and dorsal aspect of pronotum and mesonotum figured. In profile the junction of vertex and frons is round. Spur not quite so long as basitarsus, fairly narrow and moderately thick, but the inner surface distinctly concave, about 14 irregular teeth alternately large and small on hind margin.

Opening of pygofer broader than long, anal emargination large, anal angles rounded, not produced; anal segment with two large spines with their bases close together. Dorsal margin of diaphragm rounded. Genital styles nearly straight on outer margin, the inner margin convex on basal half and slightly concave on apical portion; apical third narrower than basal two-thirds, apex truncate.

Stramineous; a light brown mark along the outer surface of antenna, a light brown band near apex of first and second tibiæ, a dark mark on mesopleuron and another on metapleuron, the diaphragm of the pygofer black. Tegmina hyaline, slightly stramineous, veins stramineous; wings hyaline slightly opaque with waxy secretion, veins light stramineous.





Eumetopina straminea.

Fig. 6.—Dorsal view of head and thorax.
Fig. 7.—Front view of frons and clypeus.

Hab. Pondoland, Port St. John (iv. 1924). Description based on one male.

26. *Eumetopina hancocki*, sp. n.

Male.—Length 3·4 mm.; tegmen 3·5 mm.

In general build similar to *E. straminea.*

Opening of pygofer large, medio-ventral margin emarginate, anal emargination large. Anal segment large with two strong spines with their bases widely separated. Dorsal margin of diaphragm slightly angularly produced. Genital styles on inner margin convex on basal half and concave on apical half, the outer margin the reverse, concave on basal half and convex on apical half, the styles being curved and recurved, broadest on basal half gradually narrowing to apex which is narrow and truncate.

Dark brown; clypeus, apex of frons, and the posterior half of pronotum light brown or yellow; the posterior angle of mesonotum pale; tarsi and spur pale; the posterior margins of abdominal tergites and the lateral margins of pygofer yellow. Tegmina hyaline, the apical cells slightly distad of the nodal line, brown, the rest much lighter brown being lightest over the nodal line, veins slightly darker than membrane; wings hyaline slightly tinged with brown, veins brown.

Hab. Uganda, Kampala (*G. L. R. Hancock*, vii. 1926). Description based on two males.

These two species are apt to be placed in the Alohini unless the spur be carefully examined.

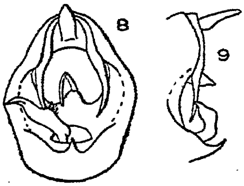
15. PEREGRINUS, Kirkaldy.

27. *Peregrinus maidis* (Ashm.).

Delphax maidis, Ashmead, Psyche, v. p. 323 (1890).

One female from Transkei, Umtala (iii. 1923), which has the fork of the median frontal carina projecting in the same way as the specimens from Natal, Weenan; two specimens from Sierra Leone, Njala (*E. Hargreaves*), and two from the Gold Coast, Accra (*J. W. Scott Macfie*). This is a very widely distributed species attached to Indian corn as well as to many other grasses.

Two species have been wrongly placed by Melichar in this genus, but as I have not seen specimens and am consequently unable to place the species correctly, I list them at the end of this paper.



Euidella semifuscipennis.

Fig. 8.—Full view of pygofer.
Fig. 9.—Lateral view of pygofer.

16. EUIDELLA, Fieber.

28. *Euidella* (?) *semifuscipennis*, Muir. (Figs. 8, 9.)

Euidella (?) *semifuscipennis*, Muir, Ann. & Mag. Nat. Hist. (9) xvii. p. 26, fig. 24 (1926).

Two males and one female from Natal, Van Reenen (xi.,

xii. 1926). If the head were a little shorter, this species could be included in the genus *Dicranotropis*. It is too wide and thick-set for inclusion in *Chloriona*, so I continue to place this species in *Euidella*, although the legs do not conform to that genus. I publish another figure of the genitalia seen at a different angle.

17. DICRANOTROPIS, Fieber.

29. *Dicranotropis turneri*, sp. n. (Fig. 10.)

Brachypterous Male.—Length 2·2 mm.; tegmen 1·3 mm. Head as wide as thorax; width of vertex at base greater than length, apex narrower than base, base about middle of eyes. Width of frons half the length, forking of median carina in middle of frons. Antennæ reaching slightly beyond base of frons, first segment longer than wide, second twice as long as first. Hind basitarsus longer than other two segments together; spur not so long as basitarsus, thin, with more than thirty teeth on hind margin. Tegmina reaching to seventh abdominal tergite.

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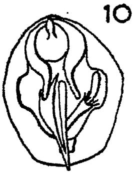


Dicranotropis turneri.
Full view of pygofer.

Full view of genitalia figured. The anal segment with two large flat processes with rounded apices. The ædeagus thin, subtubular, curved, with a large process arising from near apex and curving back, the base of process thin, widening out to a thin flat apex produced into two spines; the ventral margin of pygofer produced into a small thin plate.

Brown with lighter spots on frons, genæ, and lateral portions of pronotum, the carinæ of head and thorax also lighter; abdomen dark brown, lighter on pleura. Tegmina dark shiny brown or black.

Hab. Pondoland, Port St. John (vii., viii. 1923).

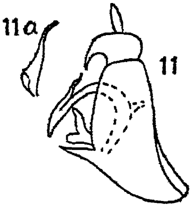
Description based on four males.

30. *Dicranotropis stramineus*, sp. n. (Figs. 11, 11 *a*.)

Macropterous Male.—Length 2 mm.; tegmen 2·8 mm. The forking of the median frontal carina level with the ocelli. Antennæ reaching a little beyond base of clypeus, first segment longer than broad, second considerably longer than first. Hind basitarsus longer than other two segments together, spur not as long as basitarsus, thin, with many (over thirty) minute teeth on hind margin.

Stramineous; some small spots on frons and the carinæ of head and thorax slightly lighter; a slightly darker mark on metapleuron, ocelli dark and large, the dark colour extending slightly beyond ocelli. Tegmina hyaline, very slightly stramineous, veins before nodal line light, beyond nodal line dark brown. Wings hyaline with darker veins.

The ventral margin of pygofer produced into two stout spines, their bases some distance apart and their apices diverging. Anal segment with two stout curved spines. In front view the styles gradually narrowing to apex which is curved outward, the base being produced into a short, stout, rounded process which is best seen in lateral view.



Dicranotropis stramineus.

Fig. 11.—Lateral view of pygofer.
Fig. 11 *a*.—Right genital style.

Macropterous Female.—Length 2 mm.; tegmen 2·8 mm. In build and colour similar to the male.

Hab. Zululand, Eshowe (vi. 1926).

Description based on one male and twelve females.

31. *Dicranotropis capensis*, Muir.

Dicranotropis capensis, Muir, Ann. & Mag. Nat. Hist. (9) xvii. p. 28, fig. 25 (1926).

One female from Port St. John, which appears to be the female of this species (vi. 1923). Original description based on a male from Cape Province, Mossel Bay.

32. *Dicranotropis lunaris*, Melichar.

Dicranotropis lunaris, Melichar, Wien. ent. Zeit. xxiv. p. 286 (1905).

Recorded from East Africa.

33. *Dicranotropis pondolandensis*, Muir.

Dicranotropis pondolandensis, Muir, Ann. & Mag. Nat. Hist. (9) xvii. p. 28, fig. 26 (1926).

Recorded from Pondoland.

34. *Dicanotropis anaxarchi*, Muir.

Dicranotropis anaxarchi, Muir, Ann. & Mag. Nat. Hist. (9) xvii. p. 29, figs. 27, 28 (1926).

Recorded from Cape Province.

35. *Dicranotropis bridwelli*, Muir.

Dicranotropis bridwelli, Muir, Bull. Ent. Res. x. p. 141 (1920).

Recorded from West Africa.

36. *Dicranotropis ibadanensis*, Muir.

Dicranotropis ibadanensis, Muir, Bull. Ent. Res. x. p. 141 (1920).

Recorded from West Africa.

37. *Dicranotropis* (?) *manicata* (Hesse).

Liburnia manicata, Hesse, Ann. S. Afr. Mus. xxiii. p. 171 (1925).

I have not been able to identify any of the material examined with this species. The characters mentioned are insufficient to indicate whether it should be referred to *Sogata* or to *Delphacodes*, the lateral pronotal carinæ, however, do not appear to be typical of *Delphacodes*. Some of the characters mentioned, *e. g.*, "the median carina (of frons) bifurcating anteriorly into two long forks," seem to point to the fact that the species belongs to the genus *Dicranotropis*.

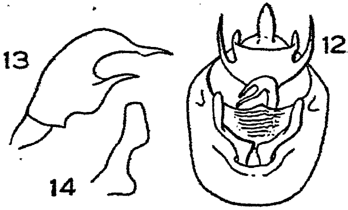
18. Kelisia, Fieber.

38. *Kelisia capensis*, sp. n. (Figs. 12, 13, 14.)

Macropterous Male.—Length 1·9 mm.; tegmen 2·6 mm.

Head slightly narrower than thorax; length of vertex 1·7 times the width, apex and base subequal in width, sides parallel, apex rounded, projecting distinctly in front of eyes, base considerably behind the middle of eyes; the Y-shape carina obscure. Length of frons twice the width, sides slightly arcuate, width at base equal to width at apex, median carina simple. Antennæ reaching slightly beyond base of clypeus; first segment short, as wide as long, second segment about three times the length of first, fairly thick with prominent sense-organs. Lateral pronotal carinæ diverging posteriorly, slightly curved, not reaching the hind margin. Hind basitarsus as long as the other two segments together, spur about as long as basitarsus, thin, with about seventeen teeth on the hind margin. *M* with two apical veins, viz., $M\,1+2$ and $M\,3+4$, which do not touch the *R* or *Cu*, the cross-veins between *R* and *M* and *M* and *Cu* slightly basad of the *M* fork.

The middle of the diaphragm of the pygofer is thickened and dark; the peculiar curved spines, one from each side of the base of the anal segment, are very characteristic of this species.



Kelisia capensis.

Fig. 12.—Full view of pygofer.
Fig. 13.—Ædeagus.
Fig. 14.—Right genital style.

Stramineous; tarsi, middle of diaphragm, and the genital styles dark brown. Tegmina and wings transparent hyaline, veins stramineous.

Hab. Cape Province, Ceres (iii., iv. 1925). Two male specimens.

The genitalia of this species bear certain resemblances to those of *Kelisia snelli*, Muir.

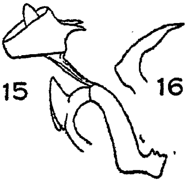
39. *Kelisia nigripennis*, sp. n. (Figs. 15, 16.)

Brachypterous Male.—Length 2·4 mm.; tegmen 1·2 mm.

Head nearly as wide as thorax. Vertex slightly longer than wide, apex and base subequal in width, apex rounded, projecting beyond the eyes, base about middle of eyes.

Length of frons about twice the width, sides slightly arcuate, an obscure fork on median carina reaching to about level of ocelli. Antennæ reaching to base of clypeus, first segment short, as long as broad, second nearly three times as long as first. Lateral pronotal carinæ straight, diverging posteriorly, obscurely reaching hind margin. Hind basitarsus longer than other two segments together, spur not so long as basitarsus, wide, thin, with about thirty teeth on hind margin. Tegmina reaching to the fourth abdominal tergite.

Margins of pygofer entire; anal emargination shallow, anal angles obscure, rounded. Dorsal margin of diaphragm U-shaped, no armature. Anal segment with two spines with their bases far apart situated about the middle of the length of the anal segment. Ædeagus flat, thin, shape shown in figure. Genital styles small, shape in flat view figured.



Kelisia nigripennis.

Fig. 15.—Anal segment and ædeagus.
Fig. 16.—Right genital style.

Head, thorax, and legs very light brown or yellow, slightly darker on lateral portion of pronotum behind eyes, the darker portion having four light spots in it; thoracic pleura slightly fuscous. Abdomen dark brown or black, pleura lighter. Tegmina shiny black or very dark brown.

Hab. Pondoland, Port St. John (v. 1923).

Description based on one male.

The forked median frontal carina might be considered sufficient reason for placing this species in *Dicranotropis*, but the fact that the vertex is longer than broad, and that the vertex and frons in profile are more angular, combined with the shape of the lateral pronotal carinæ, excludes it from that genus. It is best placed in *Kelisia* for the present. The macropterous form of this species is nearly sure to have hyaline tegmina.

19. CHLORIONA, Fieber.

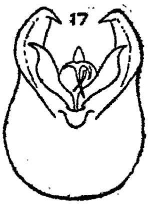
40. *Chloriona snelli*, sp. n. (Fig. 17.)

Macropterous Male.—Length 2 mm.; tegmen 2·9 mm.

Length of vertex nearly twice (1·8) the width at base, base slightly broader than apex and considerably before the middle of eyes; length of frons 2·5 times the width, sides slightly arcuate, median carina simple. Antennæ terete, reaching to apex of clypeus, second segment 2·4 times the length of first. Hind basitarsus longer than other two segments together; spur not as long as basitarsus, wide, thin, with small distinct teeth on hind margin.

Yellow or pale stramineous, a small black dot in middle of base of clypeus. Tegmina hyaline, slightly yellow, veins similar. Wings hyaline, veins slightly yellowish.

Genitalia figured; the anal angles of pygofer greatly produced, drawn out into an acute point and turned inward; the anal segment has two asymmetrical spines, one long, slender, and slightly curved, the other short, thick, and strongly curved; the ædeagus passes between them.



Kehsia snelli.
Ventral view of pygofer.

Hab. Zanzibar (*H. J. Snell*, i.–ii. 1925).

Description based on two males. There are two females which I refer to this species. In these specimens the antennæ are much shorter, otherwise in colour and build they agree with the males.

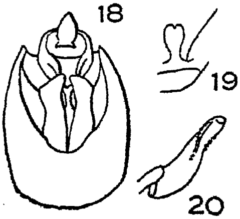
41. *Chloriona turneri*, sp. n. (Figs. 18, 19, 20.)

Macropterous Male.—Length 2·7 mm.; tegmen 3 mm.

Length of vertex 1·5 times the width at base, base slightly wider than apex, about middle of eyes, apex projecting in front of eyes; length of frons 2·5 times the width, sides slightly curved, base slightly narrower than apex, median carina simple. Antennæ reaching about middle of clypeus, first segment longer than wide, second longer and thicker than first. Lateral pronotal carinæ divergingly curved posteriorly, not reaching hind margin. Spurs about as long as hind basitarsus, fairly wide, thin, with about twenty small teeth on hind margin.

The genitalia figured; the ædeagus has a flange on the left side on apical half with the margin serrate, three or four teeth on ventral aspect at apex and a few on right side.

Head black or dark brown, the base of vertex and between the areolets yellow or white, the antennæ lighter brown, and in some cases the carinæ slightly lighter. Pronotum dark brown or black, with the middle white or light yellow and a light mark behind antennæ; mesonotum dark brown or black with the middle light yellow or white; legs light brown, the coxæ darker.



Chloriona turneri.

Fig. 18.—Full view of pygofer.
Fig. 19.—Armature of diaphragm.
Fig. 20.—Ædeagus.

Abdomen dark brown with the apical margin of the sternites pale. Anterior half of tegmina hyaline, posterior half, including clavus, basal median cell, *Cu* cells, the second and third apical median cells, and the *Cu* median cells fuscous; commissure white; veins brown in posterior half, yellowish in anterior half. Wings hyaline, slightly fuscous, veins dark.

Female similar to male, but inclined to be slightly lighter, and the carinæ of head lighter.

Seventeen specimens from Ceres, Cape Province; two from Umtata, Transkei, and one from Eshowe, Zululand (March and April 1923, 1925).

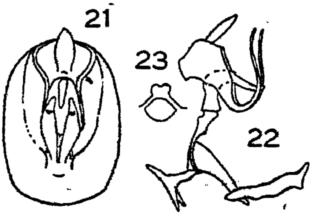
This species is allied to *Sogata neovittacollis*, Muir.

42. *Chloriona* (?) *longispinus*, sp. n. (Figs. 21, 22, 23.)

Macropterous Male.—Length 2 mm.; tegmen 2·5 mm.

Head slightly narrower than thorax; length of vertex greater than width (1·25 to 1). Length of frons 1·7 times the width, sides arcuate, median carina narrowly and obscurely furcate at base. Antennæ reaching slightly beyond the base of clypeus, first segment longer than broad, second twice the length of first. Lateral pronotal carinæ divergingly curved posteriorly, not reaching hind margin. Hind basitarsus as long as other two segments together; spur nearly as long as basitarsus, narrow, concave on inner surface, about twelve teeth on hind margin.

Genitalia figured; anal segment with two long slender spines curved round and upward. The diaphragm very short, the middle of dorsal margin produced into two small rounded processes.



Chloriona longispinus.

Fig. 21.—Full view of pygofer.
Fig. 22.—Anal segment, ædeagus, and left genital style.
Fig. 23.—Diaphragm.

Stramineous; the bases of front coxæ slightly fuscous; abdomen slightly darker. Tegmina hyaline, very slightly stramineous, veins slightly darker; granules small with black hairs. Costal and apical margin and commissure brown. Wings hyaline, slightly stramineous, with slightly darker veins.

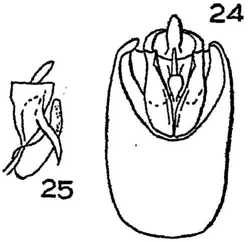
Hab. Zululand, Eshowe (v. 1926).

Description based on one male. The spur of this species approaches that in the Alohini, and further material may show that it belongs to that group. If so, then a new genus will have to be erected for the species.

43. *Chloriona fuscipennis*, Muir. (Figs. 24, 25.)

Chloriona fuscipennis, Muir, Canadian Entom. li. p. 38, fig. 10 (1919).

Recorded from Natal and Ceres, Cape Province (ii., iii. 1925); also known to occur in British Guiana, South America.



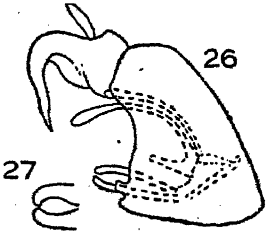
Chloriona fuscipennis.

Fig. 24.—Full view of pygofer.
Fig. 25.—Lateral view of anal segment and ædeagus.

20. SOGATA, Distant.

44. *Sogata vanreeneni*, sp. n. (Figs. 26, 27.)

Macropterous Male.—Length 2·6 mm.; tegmen 1·9 mm. Head narrower than thorax; length of vertex equal to the width at base, apex narrower than base, base about middle of the eyes. Length of frons double the width, apex and base of equal width, the median carina forking slightly more than one-fourth from the base. Antennæ reaching slightly beyond the apex of frons, first segment longer than broad, second segment nearly double the length of the first. Lateral pronotal carinæ diverging posteriorly, straight, reaching, or nearly reaching, the hind margin.



Sogata vanreeneni.

Fig. 26.—Lateral view of pygofer.
Fig. 27.—Apices of genital styles.

Hind basitarsus equal in length to the other two segments together; spur not as long as hind basitarsus, thin, tectiform, the hind margin with a few (four or five) small teeth in the middle. These can easily be overlooked, in which case the species might be placed in the Tropidocephalini.

The opening of the pygofer longer than wide; anal emargination wide and shallow, anal angles obscure, a small projection on each side in a medio-lateral position. Anal segment large and produced into two large spines curved ventrad with their bases wide apart. Genital styles fairly long, narrow, curved at the apex. The ædeagus consists of a long, thin, curved dorsal portion and a short straight ventral arm, the base being at their junction. The functional orifice appears to be at the apex of the shorter portion.

Stramineous; a thin line along antennæ, the apex of the labium and the apical tarsal joints dark. Tegmina and wings hyaline, veins stramineous. The macrotrichia on tegmina sparse, fine, black.

R in contact with *M* 1+2 for some distance; *M* 3+4 not touching *Cu*.

Hab. Natal, Van Reenen (xii. 1926). This species is dedicated to the Africander pioneer whose name is given to the locality in the Drakensburgs. Description based on one male.

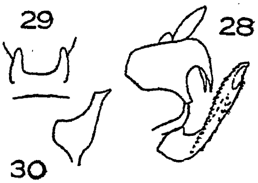
45. *Sogata rhodesi*, sp. n. (Figs. 28, 29, 30.)

Macropterous Male.—Length 1·9 mm.; tegmen 2·3 mm.

Head narrower than thorax; vertex longer than broad (1 to 1·3), width at base greater than at apex (1 to 1·4), base about middle of eyes, apex distinctly projecting in front of eyes; length of frons 2·3 times the width, sides very slightly arcuate, base narrower than apex, median carina simple or very narrowly furcate at base; antennæ reaching slightly beyond the base of clypeus, first segment longer than wide, second about twice the length of first, fairly thick. Lateral pronotal carinæ diverging posteriorly, straight, not quite reaching the hind margin. Hind basitarsus slightly longer than the other two segments together, spur not quite as long as basitarsus, thin, fairly wide, with about twenty teeth on hind margin.

Opening of pygofer about as wide as long, margins entire, anal angles rounded, obscure, anal emargination shallow. The diaphragm short, armature figured; the ædeagus has a flange from dorsal aspect at apex over the left side to near base on ventral aspect, the margin of this flange being serrated; on the right side there are five or six small spines from near apex to near base. The anal segment with two strong flattened spines.

Vertex yellow; frons and genæ brown, the gena before the transverse carinæ dark brown, the median carina of frons light; antennæ light brown. The middle and lateral portions of pronotum yellow or light brown, dark brown between; mesonotum yellow between the lateral carinæ, dark brown laterally. Coxæ, pleura, and abdomen dark brown, legs lighter. Tegmina hyaline, fuscous over the apical *Cu* and *M* cells, slightly yellowish over clavus, commissure white, veins same colour as membrane or slightly yellowish, granules small, few, and of the same colour as the veins. Wings hyaline, clear, veins slightly fuscous.



Sogata rhodesi.

Fig. 28.—Anal segment and ædeagus
Fig. 29.—Diaphragm.
Fig. 30.—Right genital style.

Hab. Zululand, Eshowe (vi. 1926).

Description based on one male.

46. *Sogata krugeri*, sp. n. (Figs. 31, 32, 33.)

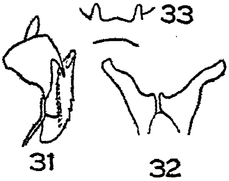
Macropterous Male.—Length 1·9 mm.; tegmen 2 mm.

Fairly long and narrow; length of vertex 1·5 times the width, apex projecting well beyond the eyes, narrower than base, rounded with the carina projecting in middle, base behind the middle of eyes, the medio-lateral carinæ meeting at apex, the Y-carina obscure. Length of frons twice the width, base narrower than apex, sides slightly arcuate. Antennæ reaching a little beyond the base of the clypeus, first segment as wide as long, second segment twice or more than twice the length of first. Lateral pronotal carinæ diverging slightly posteriorly, straight, reaching hind margin. The length of the head and thorax twice the width of the head including eyes. Hind basitarsus about as long as the other two segments together; spur with about sixteen teeth on hind margin.

The vertex between the medio-lateral carinæ light yellow or white, the areolets brown; frons and genæ brown with lighter carinæ, clypeus light brown; antennæ light brown. Middle of pronotum and mesonotum light yellow, lateral portions dark brown, the lateral margins of pronotum pale. Front and middle coxæ and pleura dark brown, legs light brown or yellow. Abdomen brown. Tegmina hyaline, fuscous brown, lighter at node and surrounding membrane, commissure white extending along hind margin to apex of *Cu*; veins dark with small dark granules. Wings light fuscous with dark veins.

Hab. Pondoland, Port St. John (v. 1923; iv. 1924).

Description based on two males.



Sogata krugeri.

Fig. 31.—Anal segment and ædeagus.
Fig. 32.—Genital styles at slightly different angles.
Fig. 33.—Diaphragm.

There is one male specimen from Cape Province, Ceres, in which the genitalia are the same as in the above specimens, but the head and thorax are much darker, nearly black, the carinæ are dark, and the light mark over vertex, pronotum, and mesonotum is reduced and obscure. For the present I have referred it to this species, but have refrained from including it in the type-material.

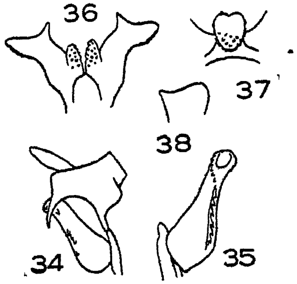
In the length of the head and thorax compared with the width of the head this species resembles *Stenocranus*, but the small size and the shape of the vertex indicate its true position in *Sogata*.

47. *Sogata flaviceps*, sp. n. (Figs. 34–38.)

Macropterous Male.—Length 2 mm.; tegmen 3 mm.

Head nearly as broad as thorax; length of vertex slightly greater than width (1 to ·8), apex slightly narrower than base, base considerably behind the middle of eyes, apex projecting slightly in front, the lateral and median carinæ standing out distinctly. Medio-lateral carinæ meeting at apex. The length of head, pronotum, and mesonotum 1·7 times the width of head including eyes. Length of frons twice the width, base and apex subequal in width, sides slightly arcuate. Antennæ reaching slightly beyond the base of clypeus, first segment longer than wide, second segment nearly twice the length of first. Lateral pronotal carinæ straight, diverging posteriorly, not quite reaching the hind margin. Hind basitarsus equal in length to the other two segments together, spur not as long as basitarsus, twenty small teeth on hind margin.

Margins of pygofer entire, anal angles obscure, anal emargination shallow ; diaphragm short, the middle elevated in a heart-shaped process beset with small teeth along the sides and apex. Anal segment with two strong spines, their bases not very close together. The genital styles short, wide, apical margin wide, the outer angle roundly produced, the inner angle angularly produced. Ædeagus broad on basal half, narrower on apical half, a row of six small teeth along the left side of ventral area, continued to apex as six separate teeth, three or four small teeth on right side of ventral area.



Sogata flaviceps.

Fig. 34.—Anal segment and ædeagus.
Fig. 35.—Ædeagus.
Fig. 36.—Genital styles.
Fig. 37.—Armature of diaphragm.
Fig. 38.—Apex of genital style, a slight variation in one specimen.

Head and antennæ yellow ; middle and lateral portions of pronotum yellow, light brown between ; middle of mesonotum between the carinæ yellow, lateral portion brown ; pleura and legs yellow except the first and middle coxæ which are brown ; abdominal sternites and the pygofer yellow, abdominal tergites light brown, genital styles and diaphragm dark brown.

The anterior half of the tegmina including the costal, subcostal, and radial cells hyaline, the posterior half light fuscous, the apical *M* cells being darkest; commissure white; veins same colour as membrane. Wings hyaline, slightly fuscous, veins dark.

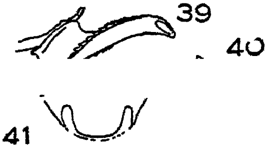
Hab. Zululand, Eshowe (iv., v., vi. 1926).

Description based on six males.

There is some slight variation in the shape of the apex of the genital styles (*vide* fig. 38).

48. *Sogata furcifera* (Horv.) *capensis*, subsp. n.
(Figs. 39, 40, 41.)

There is a long series from various localities which I refer to this species, but in which the genital styles depart as much from the type as do those of the subspecies *kolophon* and *nigeriensis*; I therefore name this form *capensis*. The right genital style is figured. This is one of the most widely distributed of the Delphacidæ, and the species in which the greatest difference in the genital styles has been noted. There are a number of synonyms (*vide* H. S. P. Ent. Bull. xv. (1924) p. 13).



Sogata furcifera capensis.

Fig. 39.—Ædeagus.
Fig. 40.—Genital style.
Fig. 41.—Diaphragm.

49. *Sogata cubana* (Crawford).

Dicranotropis cubanus, Crawford, Proc. U.S. Nat. Mus. xlvi. p. 595 (1914).

Megamelus flavolineatus, Muir, Bull. Ent. Res. x. 2, p. 143, fig. 8 *a*, *b*, *c* (1920).

Recorded from Nigeria, also known to occur in Cuba and Porto Rico.

50. *Sogata neovittacollis*, Muir.

Sogata neovittacollis, Muir, Ann. & Mag. Nat. Hist. (9) xvii. p. 32, figs. 30, 31, 32 (1926).

Recorded from Pondoland, Port St. John.

51. *Sogata albofimbriata*, Muir.

Sogata albofimbriata, Muir, Ann. & Mag. Nat. Hist. (9) xvii. p. 33, figs. 33, 34 (1926).

Recorded from Pondoland, Port St. John.

52. *Sogata nigricaudata*, Muir.

Sogata nigricaudata, Muir, Ann. & Mag. Nat. Hist. (9) xvii. p. 33, figs. 35, 36, 37 (1926).

Recorded from Pondoland, Port St. John.

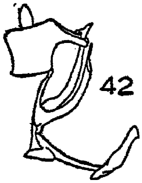
21. DELPHACODES, Fieber.

53. *Delphacodes turneri*, Muir. (Fig. 42.)

Delphacodes turneri, Muir, Ann. & Mag. Nat. Hist. (9) xvii. p. 35 (1926).

Five macropterous females, one brachypterous female, and one macropterous male from Zululand (Eshowe), Natal (Kloof), and Pondoland (Port St. John).

The description of this species was originally based on five macropterous females from Pondoland (Port St. John). In the brachypterous female the tegmina reach to the base of the seventh abdominal segment; they are fuscous with a hyaline band across the basal half of each, the apical margin being white.



Delphacodes turneri.

Anal segment, ædeagus, and left genital style.

The opening of the male pygofer about as long as wide, anal emargination large, anal angles rounded; diaphragm level with the sides of pygofer, dorsal margin wide V-shaped with a minute projection in the middle. Anal segment with two large flat projections with their bases far apart, apices rounded. Ædeagus thin, tubular, produced into a fine point at apex; from the base arises a longer thin process parallel to the ædeagus, with a rounded apex and a small process projecting shortly before the apex. Genital styles small.

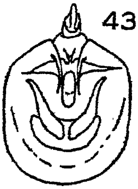
54. *Delphacodes hargreavesi*, sp. n. (Figs. 43, 44.)

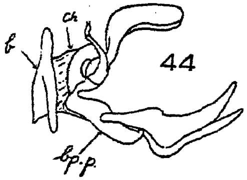
Macropterous Male.—Length 1·4 mm.; tegmen 1·7 mm.

Vertex broader than long, hind margin slightly anterior to the middle of eye, head distinctly narrower than thorax. Length of frons 1·3 times the width. Antennæ reaching about middle of clypeus, second segment twice the length of first. Hind tibial spur small, thin, hind margin with small teeth.

Dark shiny brown, legs and abdomen lighter. Tegmina hyaline slightly tinged with brown, veins brown, granules sparse, brown. Wings hyaline with brown veins.

The diaphragm of pygofer not sunk below the margins but level with them, the anal angles angular, turned inward and drawn out into a long fine spine, two small blunt spines on ventral side of anal segment. The chamber (fig. 44, *ch.*) and bridge (fig. 44, *b.*) are of peculiar structure, different from any other examined by the writer.





Delphacodes hargreavesi.

Fig. 43.—Full view of pygofer.
Fig. 44.—Ædeagus and genital styles. *ch.*, chamber; *b.*, bridge; *bp.p.*, basal plate prolongation.

Description based on one male, in not a very good condition.

Hab. Sierra Leone (*E. Hargreaves*).

55. *Delphacodes hessei*, sp. n. (Figs. 45, 46.)

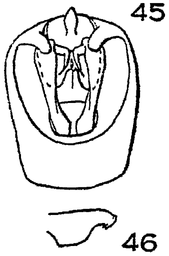
Macropterous Male.—Length 2 mm.; tegmen 2·8 mm.

Head not quite so wide as thorax; vertex about as broad as long; length of frons twice the width, sides slightly arcuate, median carina forked at base. Antennæ reaching to base of clypeus, first segment slightly longer than broad, second twice the length of first. Lateral pronotal carinæ diverging posteriorly, slightly curved, not reaching hind margin. Hind basitarsus slightly longer than the other two segments together; spur wide, not quite as long as basitarsus, with about 25–30 teeth on hind margin.

Stramineous; dark brown between carinæ of frons and clypeus, lighter brown or fuscous on genæ between carinæ, lighter over median carina of mesonotum. Tegmina hyaline, slightly stramineous, apical veins dark brown extending a little way along *M* and *Cu* 1, where it extends out into the membrane, apical *Cu* and *M* 3, 4 cells slightly fuscous, veins before nodal line pale. Wings hyaline with dark veins.

Brachypterous Male.—Length 1·7 mm.; tegmen 1·2 mm.

Tegmina reaching to apex of abdomen, otherwise in structure similar to macropterous form. In colour also similar, but the abdomen darker, the tegmina hyaline, slightly stramineous, veins the colour of the membrane, slightly fuscous along the apex and at apex of clavus.



Delphacodes hessei.

Fig. 45.—Full view of pygofer.
Fig. 46.—Ædeagus.

Opening of pygofer large, about as long as broad, margins entire, anal emargination large, anal angles large, produced into wide processes curved inward, with rounded apices. Anal segment with two long slender spines with their bases close together. The diaphragm produced into a slightly bilobed process in middle of the dorsal margin. Ædeagus small, thin, flattened laterally, the outline figured. Genital styles long, apical half considerably flattened, basal half more cylindrical.

Hab. Pondoland, Eshowe (vi. 1926).

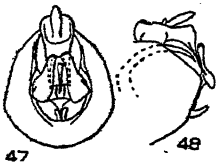
Description based on one brachypterous and three macropterous males.

56. *Delphacodes complexa*, sp. n. (Figs. 47, 48.)

Macropterous Male.—Length 1·7 mm.; tegmen 2·5 mm.

Head nearly as broad as the thorax; vertex broader than long, apex as wide as base, projecting slightly in front of eyes, base well in front of the middle of eyes; length of frons twice the width, sides slightly arcuate, median carina simple. Antennæ reaching to base of clypeus, first segment slightly longer than wide, second nearly three times the length of first. Lateral pronotal carinæ diverging posteriorly, slightly curved, not reaching the hind margin. Hind basitarsus as long as the other two segments together, spur shorter than basitarsus, thin, tectiform, with about sixteen teeth on hind margin. *R* touching *M* 1+2 and *M* 3+4 touching *Cu* for a short distance.

Lateral margins of pygofer angularly produced; anal emargination median, anal angles obscure, not produced. Diaphragm short, middle raised into two ridges. Anal segment long, produced into two long slender spines with their bases wide apart. Genital styles complex and best understood from the figures. Ædeagus long, subtubular, slender, curved.



Delpnacodes complexa.

Fig. 47.—Full view of pygofer.
Fig. 48.—Lateral view of pygofer.

Yellow; fuscous between the carinæ of frons, clypeus, and genæ. Abdomen and genitalia dark brown, pleura and anal segment yellow. Coxæ and pleura fuscous. Tegmina hyaline, commissure white, veins before nodal line slightly darker than membrane, apical of nodal line light brown. Wings hyaline with brown veins.

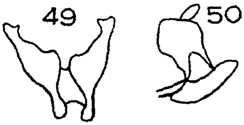
Hab. Cape Province, Queenstown (ii. 1923); Natal, Van Reenen (i. 1927).

Description based on three males. The genital styles of this species are very complex. The genitalia as a whole are very distinct, and do not resemble those of any other species.

57. *Delphacodes ceresensis*, sp. n. (Figs. 49, 50.)

Macropterous Male.—Length 1·3 mm.; tegmen 2·2 mm. Head nearly as broad as thorax; vertex as long as broad, apex projecting slightly in front of eyes, base behind the middle of eyes. Length of frons 1·7 times the width, sides slightly arcuate, base slightly narrower than apex, median carina simple. Antennæ reaching base of clypeus, first segment longer than broad, second nearly twice the length of first (1·8 to 1). Lateral pronotal carinæ diverging posteriorly, very slightly curved, not reaching hind margin. Hind basitarsus as long as, or very slightly longer than, the other two segments together, spur not quite so long as basitarsus, broad, thin, subtectiform, with 25 to 30 teeth on hind margin. *R* touching *M* 1+2 and *Cu* touching *M* 3+4 for a short distance.

Dark shiny brown or black; carinæ of head and pronotum, the hind margin of mesonotum, tegulæ, and legs lighter, the legs with longitudinal darker marks. Tegmina hyaline very slightly tinged with fuscous, veins before nodal line very little darker than membrane, the apical veins beyond nodal line and the margins darker brown. Wings hyaline with brown veins.



Delphacodes ceresensis.

Fig. 49.—Genital styles.
Fig. 50.—Anal segment and ædeagus.

The genitalia closely resemble those of *D. varia*, Hesse, as figured above. The genital styles differ as shown in figures.

Macropterous Female.—In build and colour similar to male.

Hab. Cape Province, Ceres (iii. 1925); Queenstown (i. 1923); Pondoland, Port St. John (iv. 1923).

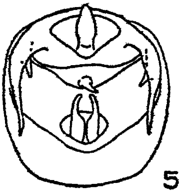
Description based on two males and one female.

58. *Delphacodes parvistylus*, sp. n. (Figs. 51, 52.)

Macropterous Male.—Length 2 mm.; tegmen 2·4 mm.

Head narrower than thorax; length of vertex equal to the width at base, apex narrower than the base, projecting slightly in front of eyes with the apex of the V-carina projecting in front; base about the middle of the eyes.

Length of frons twice the width, apex slightly broader than the base, sides slightly arcuate, the median carina simple. Antennæ reaching about the middle of the clypeus, first segment longer than wide, second slightly longer than first. Lateral pronotal carinæ diverging posteriorly, slightly curved but not following the hind margin of eye, not reaching the hind margin of pronotum. Hind basitarsus as long as the other two segments together, spur about as long as basitarsus with about fourteen teeth on hind margin. In the male on one tegmen *R* is amalgamated with *M* 1 to the apex, while on the other tegmen it parts from *M* 1 to the apex. In one female *R* and *M* 1 part about the middle of *M* 1, and in the other female they part much nearer the apex, and on one side there is an extra vein from *M* 1 + 2 to *M* 3 + 4 forming an extra apical cell. Such aberrations are common in the apical veins of Homoptera and should be remembered when considering fossil tegmina.



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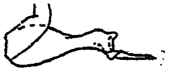


52

Delphacodes parvistylus.

Fig. 51.—Full view of pygofer.
Fig. 52.—Ædeagus.

Opening of pygofer wider than long, margins entire, anal emargination wide, anal angles obscure; anal segment very large, apical margin wide with a large spine at each angle, both of which reach to the level of the base of the genital styles; there is a minute spine on the inner side at the base of these large spines. The genital styles are small, and the ædeagus is complex at its apex, as can be seen in fig. 52.

Dark brown; the carinæ of head and pronotum and the hind and lateral margins of pronotum lighter. The apices of the tibiæ and the tarsi lighter. Tegmina hyaline, veins brown; fuscous-brown over *M* fork, the colour running over *Cu*, the brown of the apical veins spreading slightly into the membrane; brown at base and a brown mark on commissure at apex of claval vein, the commissure before this mark white. Wings hyaline with brown veins.

Macropterous Female.—Length 2·5 mm.; tegmen 2·7 mm. In general build and colour similar to male.

Hab. Cape Province, Ceres (iii., iv. 1925).

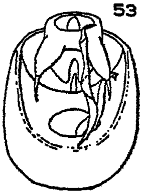
Description based on one male and two females.

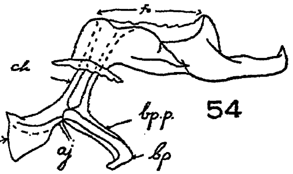
59. *Delphacodes longispinus*, sp. n. (Figs. 53, 54.)

Macropterous Male.—Length 2 mm.; tegmen 2·3 mm.

Head narrower than thorax; vertex wider than long, apex subequal to base in width, projecting very slightly beyond the eyes, base considerably behind the middle of eyes, the length of the head including eyes half the width of the head including eyes; the stem of the Y-carina obscure and the fork more like an arc. Length of frons 1·3 times the width, lateral margins slightly arcuate, median carina simple. Antennæ reaching beyond the base of clypeus, first segment longer than broad, second segment not quite twice the length of the first. Lateral pronotal carinæ widely diverging posteriorly and slightly curved, not reaching hind margin. Hind basitarsus as long as the other two segments together, spur small, not quite as long as basitarsus, thin, hind margin with twelve teeth.

53





54

Delphacodes longispinns.

Fig. 53.—Full view of pygofer with the left genital style and left spine from the medio-ventral margin omitted.

Fig. 54.—Ædeagus. *ch.*, chamber; *b.*, bridge; *aj.*, ejaculatory duct; *bp.p.*, basal plate prolongation; *bp.*, basal plate; *f.o.*, functional orifice.

The genitalia are best understood from the figures, the most conspicuous parts are the two long spines arising from the medio-ventral margin and the large spines on the anal segment.

The penis is of considerable interest on account of its peculiar shape. The functional orifice appears to be large (*f.o.*) and the chamber (*ch.*) runs through the penis to the *f.o.* (fig. 54).

Head and thorax black, abdomen dark brown, antennæ and legs lighter brown. Tegmina hyaline, veins brown, including the commissure, granules darker, small, not numerous, fuscous over the cell between *M* 3+4 and *Cu*.

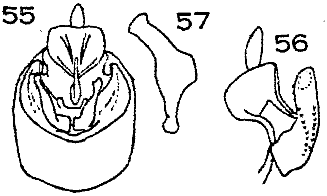
Only two *Ms*, viz. 1+2 and 2+3, and *M* does not touch *R* or *Cu*.

Hab. Orange Free State, Harrismith (iii. 1927), one male specimen.

60. *Delphacodes varia* (Hesse). (Figs. 55, 56, 57.)

Liburnia varia, Hesse, Ann. S. African Mus. xxiii. (1) p. 171 (1925).

I have not seen the type of this species, but there are eight specimens in the British Museum marked co-types, five are males and three females. One specimen belongs to the genus *Chloriona*. I have selected one male for dissection and figured the genitalia. Among Mr. Turner's collections there are specimens from Pondoland, Port St. John (iv. 1923), and Orange Free State, Harrismith (iii. 1927).



Delphacodes varia.

Fig. 55.—Full view of pygofer.
Fig. 56.—Anal segment and ædeagus.
Fig. 57.—Left genital style.

This species is closely allied to *Delphacodes terryi*, Muir, from Java and Formosa, but I do not care to synonymise it until I have examined the ædeagus of *D. terryi*.

61. *Delphacodes matanitu* (Kirk.).

"*Delphax*" *matanitu*, Kirkaldy, Haw. Sugar Planters' Ent. Bull. (1907).

Two macropterous males from Zululand, Eshowe (v. 1926), and Cape Province, Mossel Bay (i. 1922).

In these specimens the vertex at the sides is as long as wide and in the middle slightly longer. If *D. matanitu* is regarded as distinct from *D. nigripennis*, then these specimens must be referred to the former species.

D. matanitu is known from Fiji and Papua, *D. nigripennis* from Nicaragua and Jamaica.

62. *Delphacodes propinqua* (Fieber).

Delphax propinqua, Fieber, Verh. d. k.-k. zool.-bot. Ges. Wien, xvi. p. 525, pl. viii. fig. 24 (1866).

This is a very widely distributed species and has several synonyms (*vide* Haw. Sugar Pltrs. Ent. Bull. 15 (1924), p. 31). It appears to be one of the commonest species in South Africa and is widely distributed in that region.

22. DELPHACODOIDES, gen. nov.

Head about as wide as thorax; vertex wider than long, base as wide as apex, lateral margins slightly concave, the stem of the normal Y-carina absent or very obscure, otherwise the carinæ similar to *Delphacodes*, the medio-lateral carinæ continued on to the frons as a short fork of the median frontal carina; base of vertex about middle of eyes. Length of frons about twice the width, sides slightly convex, base as wide as apex, the median carina narrowly forked on basal third; clypeus tricarinate. In profile the junction of frons and vertex rounded, the clypeus curved. Antennæ fairly short and thick, reaching slightly beyond the base of clypeus; first segment longer than wide, apex thicker than base, second segment slightly longer than first. Pronotum tricarinate, lateral carinæ nearly straight, reaching hind margin and in line with lateral mesonotal carinæ. Mesonotum tricarinate, all three subparallel. In tegmina *R* touching *M* 1+2 and *Cu* 1 touching *M* 3+4 for short distance. Hind basitarsus equal to the other two segments together; spur not quite so long as hind basitarsus, thin, fairly broad, concave on inner surface, convex on outer surface, about seventeen teeth on hind margin.

This genus is close to *Delphacodes*, but the straight lateral pronotal carinæ reaching the hind margin distinguishes it; from *Sogata* and *Megamelus* it differs by the fact that the vertex is broader than long, and the head wide, also by the stoutness of the general build. The question as to whether this and other allied species should be separated into groups (subgenera) within one genus or into several genera is of minor importance, so long as the characters separating the groups are recognised.

Type, *Delphacodoides ornata*.

63. *Delphacodoides ornata*, sp. n.

Macropterous Female.—Length 2·7 mm.; tegmen 3·2 mm.

Head brown; the carinæ and the genæ beneath the antennæ yellow or much lighter brown, the genæ in front of antennæ and the frons along the carinæ darker; the apex of the first segment of antennæ and the base of the second darker brown; pronotum and mesonotum brown with pale carinæ, the areas outside the lateral carinæ darkest, the postero-lateral area of pronotum pale. Femora brown, the hind femora the darkest, the tibiæ lighter, the base of the hind tibiæ dark. Abdomen dark brown, the basal plates (eighth sternite) pale. Tegmina hyaline with brown markings; the first claval cell clear, the other two light brown, the basal two-thirds of commissure white, the apical third dark brown; light brown between *M* and *Cu*, a dark brown mark from node over cross-veins or nodal line, over *Cu* and apical portion of cell to apex, a clear spot on margin between *M* 2 and *M* 3, *M* and *Cu*, and *Cu* 1 and *Cu* 1 *a*; over the nodal line the dark mark spreads along *R* and *M* 1+2 extending out into cells. Veins same colour as membrane with dark brown granules, most numerous before the nodal line. Wings clear hyaline with brown veins.

Hab. Cape Province, Ceres (iii. and iv. 1925).

Description based on seven females.

The following two species referred by Stål to *Liburnia* I am unable to place with any certainty. *L. vitticollis*, which I consider to be the type of the genus *Liburnia*, belongs to either *Chloriona* or *Sogata* as I understand them. These two genera are so strongly related that I think they will have to be considered as one. In that case the name *Liburnia* will have to be used for the genus:—

64. *Liburnia vitticollis* (Stål).

Delphax vitticollis, Stål, Öfv. Vet.-Ak. Förh. p. 93 (1855).

Cape Colony—Hesse reports this from Ovamboland.

65. *Liburnia lautipes* (Stål).

Delphax lautipes, Stål, Öfv. Vet.-Ak. Förh. p. 319 (1858).

T'kons Fountain, West Africa.

The following two species are not correctly placed by Melichar, but I cannot be sure to which genus they actually belong:—

66. *Peregrinus vegetatus*, Melichar.

67. *Peregrinus lunilifera*, Melichar.

Ergeb. Zweit. Deut. Zent.-Afr. Exp. i. pp. 133, 134 (1914).

XVII.—Orchestia deshayesii (*Amphipoda*) *on the North Coast of Scotland.* By D. M. Reid, Department of Biology, Harrow School.

According to Bate and Westwood this species is of fairly wide distribution, but is very local in its occurrence. It was first discovered in Egypt, and after that single specimens were taken from under Mount Batten, Plymouth Harbour, and several from Carrickfergus before 1863. Two other specimens from the British coasts are recorded, but the exact locality is unknown. No record of a later occurrence of *O. deshayesii* on the British coast can be found.

While carrying on some investigations during April of this year on the north coast of Scotland I came across further evidence of this organism. The locality where it occurs is a bay of fine sand (Traigh Allt Chailgeag on O.S. Map) about 3 miles east of the village of Durness, Sutherlandshire.

The specimens were first seen swimming up the stream of fresh water which flows over the sand at low tide, their presence in the water being due, in all probability, to their having been carried away along with the weed cast up on the shore by the previous high tide, or their having been washed out of the sand by the stream as it cut down its banks. Further search among the drift-weed and under boards etc. along high-water mark revealed large numbers of the organism, to the exclusion, apparently, of any other species. On disturbing them they immediately travelled up the shore for a short distance and hid in the sand.

A few specimens were collected and compared with the description given by Bate and Westwood (1), and, although undoubtedly *Orchestia deshayesii*, they differ slightly from that description, as will be seen from the following:—

	North Coast specimens.	Bate and Westwood.
1st antenna.—	Reaches to the distal end of the penultimate segment of second antenna.	Reaches halfway along the penultimate segment of the second antenna.
2nd antenna.—	Last segment is twice as long as the penultimate and about the same length as the articulated termination.	Last segment is twice as long as the penultimate and nearly three times as long as the articulated termination.

Colour.—No indication as to colour or markings is given by Bate and Westwood. All the specimens seen were pure white, with one median and two lateral rows of small dark spots along the dorsal aspect and one larger dark splash on each side along the edges of the pereion. At death the marks become bright red.

Probably on account of this peculiar colouring the species has been overlooked by collectors, for, although easily visible when moving, it is quite indistinguishable when lying quiet on sand.

REFERENCE.

(1) BATE & WESTWOOD. 'History of the Sessile-eyed Crustacea,' vol. i. p. 36. 1863.

XVIII.—*On a Larval Form of* Acanthotænia.

By H. A. BAYLIS, M.A., D.Sc.

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ACANTHOTÆNIA, v. Linstow, 1903, is not accepted as an independent genus by some modern authorities on Cestodes, who prefer to regard it as a group of species within the genus *Proteocephalus* (=*Ichthyotænia*) *. The fact, however, remains that there is a series of forms, chiefly parasitic in species of *Varanus*, having the same character in common—viz., a covering of minute spines extending all over the scolex and usually over the whole or at least the anterior part of the strobila †, and it is convenient to speak of them as "*Acanthotænia*."

Hitherto, so far as I am aware, only the adult forms of any of these species have been observed. Recently my colleague Mr. H. W. Parker, while examining a preserved toad of the genus *Oreophryne* from Dutch New Guinea, found embedded in its liver two small whitish masses which proved to be cysts, each containing several larval Cestodes. These he kindly handed to me, and on closer examination it was evident that the larvæ belonged to the "*Acanthotænia*" type of worm.

Each cyst, or rather "nest," as it might better be called, contains about ten larvæ, which lie embedded in a mass of degenerate fibrous connective tissue, without a definite wall, and interspersed with partly calcified débris. The larvæ themselves are "plerocercoids," with an invagination at one pole containing the scolex. The general shape of the larva

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* Meggitt (1927) argues in favour of using *Ichthyotænia* as the generic name in place of the earlier *Proteocephalus*, and Ichthyotæniidæ for the family instead of Proteocephalidæ. He differs from other authors in referring the species of "*Acanthotænia*" to the genus *Crepidobothrium*.

† The presence of spinelets on the scolex is not strictly confined to these forms, but occurs also in certain Proteocephalidæ parasitic in fishes.

Fig. 1.

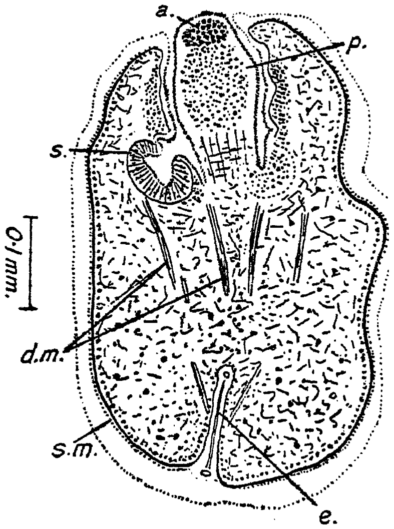

Fig. 2.

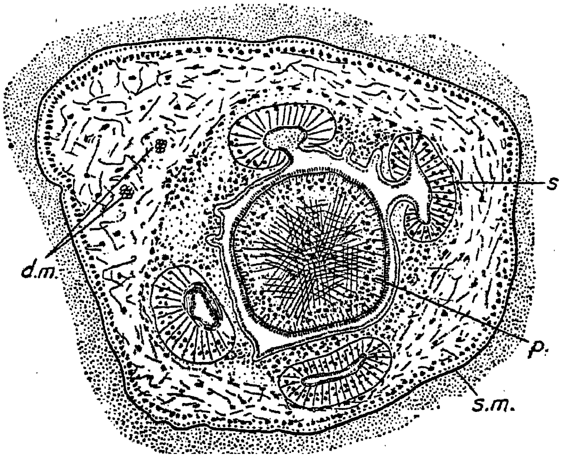

Fig. 1.—Longitudinal section through plerocercoid of *Acanthotænia*. *a*, apical organ; *d.m.*, deep longitudinal muscles; *e.*, terminal excretory duct; *p.*, apical papilla; *s.*, sucker; *s.m.*, subcuticular muscles.

Fig. 2.—Transverse section through plerocercoid of *Acanthotænia*, at level of suckers. *d.m.*, deep longitudinal muscles; *p.*, apical papilla; *s.*, sucker; *s.m.*, subcuticular muscles.

is subglobular, and the maximum diameter is about 0·5–0·6 mm. The scolex consists of a club-shaped apical papilla (figs. 1 & 2, *p.*) and four well-developed suckers (figs. 1 & 2, *s.*) appearing as depressions in the wall of the invagination. The length of the apical papilla is about 0·15–0·2 mm., and the diameter of the suckers about 0·09–0·1 mm. The papilla and almost the whole of the interior of the invagination, including the linings of the suckers, are covered with minute spines. At the apex of the papilla there is a mass of deeply-staining cells forming an "apical organ" (fig. 1, *a.*)—the vestigial fifth sucker, according to La Rue (1914). The papilla is highly muscular, being largely composed, especially towards its base, of muscular fibres crossing each other in all directions (see fig. 2).

The main body of the larva is composed of rather solid parenchyme, with the usual superficial layers. The subcuticular musculature (figs. 1 & 2, *s.m.*) consists of a single layer of transverse muscle-fibres and, immediately below these, a single layer of longitudinal fibres. Running from the base of the invagination to the posterior end of the larva, in the deeper portion of the parenchyme, there are eight to ten bundles of longitudinal muscle-fibres (figs. 1 & 2, *d.m.*). At the posterior end of the body there is a narrow invagination (fig. 1, *e.*), apparently representing the terminal duct of the excretory system.

Two species of *Acanthotænia* have been recorded from New Guinea in the adult stage, both from an unnamed species of *Varanus*. These are *A. biroi* (v. Rátz, 1900) and *A. saccifera* (v. Rátz, 1900). A number of other species are known from Australia. While it is probably useless to attempt to identify the present larval form with any of these adult forms on the basis of the few morphological characters available, it seems just possible that it may belong to *A. biroi*. V. Rátz (1900, 1901) did not give the dimensions of the suckers or of the apical papilla in this species, though he did so for *A. saccifera*, in which they appear to be too large (width of apical papilla 0·47 mm., diameter of suckers 0·15 mm.). He mentioned, however, that the entire scolex of *A. biroi* measured 0·221 mm. in length and 0·255 mm. in width, which would correspond fairly closely with its size in the larvæ here described. None of the Australian species in which the scolex has been described seem to be as near as *A. biroi* to the required size.

As has been mentioned, the life-history of no species of "*Acanthotænia*" seems to be known. A considerable body of evidence is available, however, with regard to the life-histories of other species belonging to the family Proteocephalidæ. Gruber (1878) seems to have been the first to record the occurrence of larval forms of *Proteocephalus torulosus* in Copepods (*Cyclops brevicaudatus*). The fact has been established by numerous more recent workers that the larvæ of this species and several others, mostly parasitic as adults in freshwater fishes, occur in Copepods. The same is true of species of *Corallobothrium* and *Crepidobothrium* (= *Ophiotænia*). The facts so far observed seem to point to the conclusion that, in most cases at least, only one intermediate host is necessary. The fully-formed plerocercoid is developed in the body-cavity of the *Cyclops*, usually after passing through a "procercoid" stage in which there is a posterior appendage ("cercomer") containing the original embryonic hooks. This becomes constricted off, and at the opposite pole, where the suckers are developed, an invagination frequently occurs.

The plerocercoids of several species have also been found in the viscera, abdominal cavity, or connective tissue of vertebrate hosts, often of the same species in which the adults occur. The plerocercoids of *Proteocephalus ambloplitis*, for example (Pearse, 1924; Hunter, 1928 *a*), are commonly found in many kinds of fishes, including the young of *Micropterus*, which is one of the hosts of the adult. The plerocercoids of *P. filaroides* occur in *Amblystoma tigrinum*, which also harbours the adult (La Rue, 1909). Those of *P. pinguis*, whose adult form is a parasite of the pike, occur in perch and other fishes (Hunter, 1928 *b*). Minnows (*Notropis blennius*) which feed on *Cyclops* containing the procercoids of certain species of *Corallobothrium* become infected with the plerocercoids, and the final hosts (various species of catfish) may apparently acquire infection either by ingesting *Cyclops* or by swallowing minnows (Essex, 1928). In a recent paper by Magath (1929) it is suggested that in the same way the soft-shelled turtle (*Amyda spinifera*) may be infected with *Crepidobothrium testudo* either by swallowing *Cyclops* or by swallowing fishes in which the plerocercoids derived from *Cyclops* have established themselves. In this last case, however, the plerocercoids have not actually been found in fishes, nor is it certain that the turtle devours fishes.

Analysing these instances, we may conclude that there is probably in all cases an invertebrate intermediate host, which is necessary to the development of the parasite, while there may or may not be a second (vertebrate) intermediate host, which, however, does not seem to be a necessary stage in the life-history. It seems probable that if the parasite, with its invertebrate host, be ingested by a vertebrate host while in the earlier (procercoid) stage, it does not develop at once to the adult, but may wander out of the alimentary canal into the viscera or connective tissue, and there become a plerocercoid, as it would have done in the first host. If, however, it has already reached the plerocercoid stage in the first host, it is capable of developing directly to the adult in a suitable animal.

Assuming that the life-history of the species with "*Acanthotænia*" characters is similar to that of other Proteocephalidæ, one would expect that the form here discussed had an earlier larval stage in some invertebrate (most probably a Copepod), and that the toad became infected (perhaps as a tadpole) by swallowing this first host. But, by analogy, it cannot be assumed that the toad itself is a necessary intermediate host. It would certainly be easier to understand the infection of such an animal as *Varanus* through the medium of a toad than by the direct ingestion of a *Cyclops* or some other invertebrate, but the latter possibility is not excluded.

SUMMARY.

A plerocercoid larva belonging to the "*Acanthotænia*" group of the family Proteocephalidæ, from the liver of *Oreophryne* sp., is described. It is suggested that it may possibly be the larva of *Acanthotænia biroi* (v. Rátz).

The known life-histories of other members of the family, and their bearings upon the present case, are discussed.

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XIX.—*A new Genus and new Species of Acanthocephala from the Antarctic**. By HARLEY J. VAN CLEAVE, University of Illinois, Urbana, Ill., U.S.A.

I HAVE been granted the privilege of examining some of the Acanthocephala in the collections of the British Museum. One vial of three specimens, submitted through the courtesy of Dr. H. A. Baylis, contained a label indicating that the collection was taken in the South Shetland Islands, just at the edge of the Antarctic region. These three specimens, from a fish of uncertain identity, had been tentatively determined as *Echinorhynchus campbelli*.

The bodies of the individuals under consideration bear cuticular spines arranged as a mantle (fig. 1) beginning a short distance back from the anterior extremity of the body proper. This fact, together with the conspicuous differences in the form of the proboscis and its hooks, eliminates the possibility of including these specimens under the species *E. campbelli*, or even within the genus *Echinorhynchus*. However, these same characters clearly indicate that these individuals belong to the family Rhadinorhynchidæ.

Lühe (1911 : 43) called attention to the asymmetry of the hooks on the dorsal and ventral surfaces of the proboscis in the genus *Rhadinorhynchus*, and subsequently attention has been directed to asymmetry by other writers dealing with this and other genera of Acanthocephala. However, the diversity in size of hooks on the dorsal and ventral faces of the proboscis in the worms from the South Shetland Islands surpasses anything which has been described in the literature. The proboscis is much shorter than in *Rhadinorhynchus*, the lemnisci are relatively much shorter than in that genus, and the cement-glands of the male are of distinctive form. On these grounds a new genus is being erected for the inclusion of these unique forms, and the name *Aspersentis austrinus*, gen. et sp. n., is proposed.

ASPERSENTIS, gen. nov.

Diagnosis.—With the characters of the family Rhadinorhynchidæ. Proboscis relatively short, cylindrical, with hooks of ventral surface more than twice the size of those of the dorsal. Body-spines arranged in close-set manner as a mantle near the anterior extremity of the body proper. Brain located in proboscis receptacle some distance from the posterior extremity of the receptacle. Lemnisci short, flattened, in male reaching only to the anterior testis. Testes overlapping; cement-glands pyriform, closely compacted.

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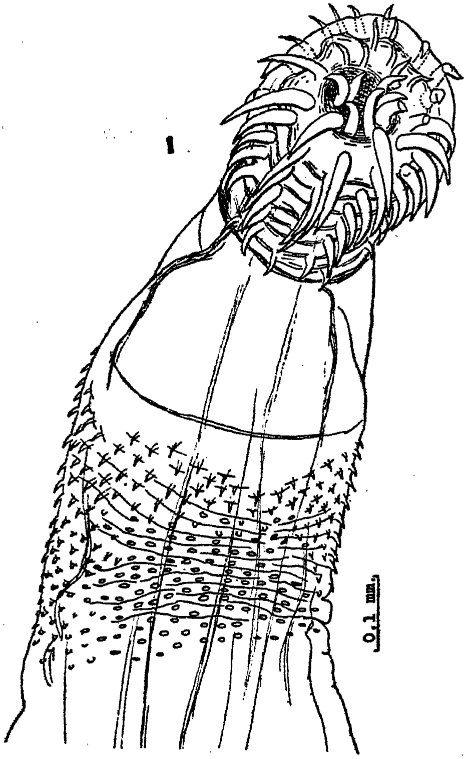
* 'Contributions from the Zoological Laboratory of the University of Illinois,' No. 346.

Type-species, *Aspersentis austrinus*, sp. n.



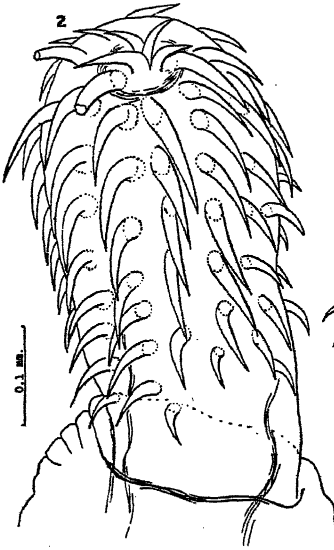
1.

Proboscis and anterior body-region of holotype male of *Aspersentis austrinus*, showing diversity of proboscis-hooks and arrangement of body-spines.

Aspersentis austrinus, sp. n.

Description based upon three individuals, of which one male is designated as holotype and two females as paratypes. Holotype about 3·25 mm. long and 0·65 mm. in diameter. Proboscis cylindrical, 0·53 mm. long and 0·23 mm. in diameter. Paratype females 4–6 mm. long, somewhat spatulate in outline, the anterior fourth (including the proboscis) cylindrical and conspicuously narrower than the adjacent posterior region. Cylindrical anterior region of body proper decked with minute spines, the tip of each invested in a triangular elevation of the cuticula ; each spine about 35 μ in length. Proboscis armed with 14–16 longitudinal rows of 9 or 10 hooks each. Hooks on ventral surface of proboscis (fig. 2) very distinctly stronger and longer than those on dorsal (fig. 3) and of entirely different form. Many hooks on ventral face 100 μ, few less than 89 μ in length, while those of dorsal face are weak, crescentic in form, and rarely exceed 30 μ in length. Hard-shelled embryos within body-cavity of gravid female 65–77 μ long by 18–24 μ in diameter. Polar prolongations of middle membrane narrow, at least twice as long as wide.

2



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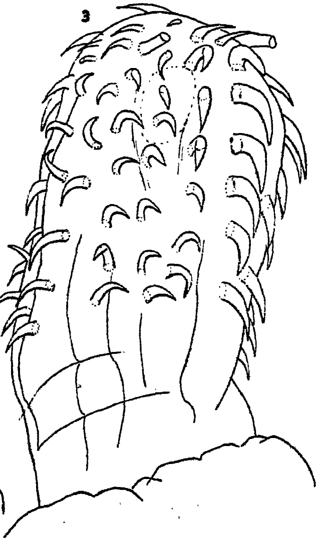


Fig. 2.—Ventral surface of proboscis, paratype female of *Aspersentis austrinus*.
Fig. 3.—Dorsal surface of same proboscis shown in fig. 2.

Host. Identity of host not certain, only available information on the label indicates "*Trematomus* or *Notothenia*" from the South Shetland Islands. Collected by A. G. Bennett.

Types. Holotype (male) and two paratypes (both female) in the collection of the British Museum (Natural History).

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

May 8th, 1929.—Prof. J. W. Gregory, LL.D., D.Sc., F.R.S., President, in the Chair.

The following communication was read:—

'A Marine Triassic Fauna from Eastern Persia.' By James Archibald Douglas, M.A., D.Sc., F.G.S.

This paper gives an account of the discovery by Mr. R. C. Jennings & Mr. K. Washington Gray, Geologists of the Anglo-Persian Oil Company, of a marine Triassic fauna in Eastern Persia. It is the first detailed record of rocks of that age from the wide stretch of country lying between the known Triassic outcrops of Asia Minor and Afghanistan. The district of Naiband, from which the collection was made, lies about 150 miles north of Kerman and 330 miles due east of Isfahan, forming part of the Median Mass within the folded zone of the Iranian Nappes. A study of the fauna shows that at least three distinct groups can be recognized:—

(3) A black limestone-and-shale group of Hauz-i-Khan, containing corals and brachiopods of Rhætic age.

(2) A calciferous sandstone group of Naiband, containing a rich lamellibranch fauna of Noric age.

(1) A lower shale group of Hauz-i-Sheikh, containing a micro-fauna, chiefly gasteropods, which have affinities with those of the St. Cassian Beds.

Comparison is made with other Triassic outcrops, and the evidence is found to suggest an extension of the Triassic Tethys into Persia in Ladinic times, and again at a later stage, in the Rhætic Period. During the intervening Noric epoch, however, communication with the Mediterranean province was severed, while species characteristic of the Trias of the East Indies make their appearance in great numbers. It is shown that there is little evidence for migration having taken place between the two areas along the 'Himalayan route', and it is suggested that the continental barrier of Gondwanaland was breaking up into an archipelago of islands, possibly somewhat similar to the East Indies of the present day, which would have formed no barrier to the distribution of a terrestrial flora, but through which a marine fauna of littoral facies could have passed.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[TENTH SERIES.]

No. 21. SEPTEMBER 1929.

XX.—*South Indian Arachnology.*—Part IV. By W. Rae Sherriffs, M.A., D.Sc., F.L.S., Professor of Zoology, University College, Southampton.

Argiopidæ (continued).

Araneus (Clerck), 1757 = *Epeira* (Walck.), 1805.

27. *Araneus excelsus* (Sim.).

Described by Simon as *Glyptogona excelsa* in Journ. Asiat. Soc. Bengal, lviii. (1889).

These small spiders, only 3 mm. long, resemble *A. laglaizei* in appearance, but have a distinct, smooth, round, blunt, black tip to the abdomen. Noted as no. 57 in my first paper (Ann. & Mag. Nat. Hist. vol. iv. no. 22, 1919), they are found at the centre of small orb-webs about 2 inches diameter.

Locality. First described from the Himalayas; specimens in the Simon Collection, Paris, are marked 6000 ft. Himalayas, Dehra Dun, and, again, Trichinopoly. They are further reported by Simon in his Maindron Voyage collection from Coonoor in the Nilgiris. My specimens come from Chingleput and Madras City, and include 5 ♀ and 1 ♂ immature.

28. *Araneus albertisii* (Thor.).

Described by Thorell in Primo Sag. sui Rag. Bir. 1887, pp. 182–185.

In my first paper (Ann. & Mag. Nat. Hist. vol. iv. no. 22, 1919) in no. 53 I noted one specimen as possibly coming under Pocock's *Araneus bilunifer*, described in his "Arachnida" ('Fauna of British India' series, 1900, p. 227) solely because of the two very conspicuous light circular spots on front of the abdomen dorsally, but noting its discrepancies in other respects.

Further examination of this specimen and comparison with those in the British Museum Collection seem to place it with *Ar. albertisii* (Thor.), where, among other things in common, the peculiar dorsal pattern of the abdomen is here seen. This pattern consists of many minute, irregularly placed, seed-like markings, giving the impression of tiny pairs of equal and parallel light lines or of a light oval split by a dark brown line.

Unfortunately, as is so often the case with him, Thorell bases his species from a single female, and that, as he admits as regards the abdomen, "cujus color ad magnam partem est deperditus." I am not certain, therefore, that *albertisii* has the two conspicuous light spots which are so prominent a feature in my specimens, of which I have five, four of which are immature.

In my previous note I mentioned the general resemblance of this spider to *Ar. rumpfi* (Thor.). Thorell himself recognizes the resemblance of *albertisii* to *Ar. hispida* (Dol.), which is the same species as his own *rumpfi*.

There is also in the British Museum Collection a tiny ♂ type-specimen of *Araneus bilunatus* (Poc.) from Chingleput, south of Madras. This specimen is quite different from mine.

Locality. The single adult female, as previously reported, from "Carolina," Coonoor, Nilgiris; the immature young from the centres of small orb-webs or resting on twigs near the orb-webs, all from Coorg. The males were got at the centre of small orb-webs high over the middle of the path some 7 feet above the ground, and swung between the trees at each side.

29. *Araneus pilulus* (Thor.) [*Epeira pilula*].

Described by Thorell in St. Rag. Mal. e Pap. i. 1877 (Celebes), pp. 48–50.

Described also by Simon as *Epeira nox* (Sim.) in "Etudes

Arach.—IX. Arach. rec. aux îles Philippines," in Ann. de la Soc. Ent. de France, 1877, 5 ser. vii. p. 77.

These small spiders are generally dark in hue; the abdomen dorsally blackish, with four small light dots centrally placed and lighter patches at the sides. The abdomen is noticeably wider than deep. These spiders were found at the centres of small orb-webs stretched high over the roadway.

Locality. The British Museum has specimens from Tharawaddy, Burma. Mine are from South Coorg, and are both females.

The common small *Araneus* around Madras and on the Nilgiris I found to be *A. laglaizei* (Sim.), described by him in Ann. Soc. Ent. Fr. 1877, p. 77. It has been reported from the Malabar coast, and is said by Simon, in the Maindron Voyage report, to be widespread in India and Malaya. Yet I came across no members of this species in Coorg.

30. Among my Coorg spiders I found ten small immature *Araneus* of both sexes which are very similar in size, shape, and colour-scheme. Ventrally they are very conspicuous, with the sternum black and also the mid-abdomen, which is adorned with four startlingly vivid white dots; the abdomen also ends dorsally in a distinctly whitish tip as a kind of tubercle. Simon, in his collection, has similar specimens undescribed from Kandy and Galle. My largest individual (♀) measured 4·5 mm. long. Further search, however, revealed three larger females reaching 7 mm., and quite recently there came into my possession from Ceylon one still larger female attaining a length of 8 mm. These last four are quite mature and have the same black sternum pointed ventrally backwards, the black median abdomen with the four white spots, the first pair on each side of the vulva and the back pair towards the spinnerets indistinctly joined along the sides to the front ones. The brownish scape is bent at right angles and is marked by two distinct black spots placed close together.

All the spiders were taken from orb-webs at their centres. In no case had the web, big or small, any stabilimentum.

Perhaps these belong to the species described as *Epeira apiculata* (Thor.) by Thorell in 'The Spiders of Burma,' p. 183 (1895). This species he founds on a single young female just over 3 mm. long. Since the type of vulva is of so much importance in settling the species, and this cannot be described until the individual is fully mature, it seems a pity to have wasted time in describing undeveloped specimens where, from the nature of the case, the new species based on such must be very doubtful.

Locality. "Charlotte Estate," Sidapur, S. Coorg.

31. There are also in my collection five female *Araneus* (one immature) with one very distinct feature in common—namely, a clear light narrow band, sometimes slightly interrupted, across the shoulders. The four adults agree in most features quite closely, and the scape is similar and bent at right angles. The dorsal pattern on the abdomen, apart from the transverse band, varies considerably. In one adult only 8 mm. long the arrangement is the irregularly scattered seed-like marks noted previously under *Ar. albertisii* (Thor.). Another female, 10 mm. long, has the livery of *Ar. theisii* (Walck.); the third, 11 mm. long, along with the fourth, 9 mm. long, greatly resembles *A. rumpfi.* When more specimens are forthcoming it may be not unlikely that all of these together with those provisionally placed (no. 28) under *A. albertisii* may prove to be varieties of *A. rumpfi,* which has already been made to contain forms previously described as separate species, so variable is its appearance and size. In this connexion see Thorell in Prim. Sag. sui Rag. Bir. pp. 179–181, under *Epeira hispida* (Dol.). I have seen no species with this white shoulder-line either in the British Museum or Simon collections.

Well over thirty years ago Simon (Hist. Nat. des Araig. i. p. 827) noted this genus *Araneus* as the largest among the spiders, with then some 800 described species when made to include not only *Epeira,* but also *Zilla, Singa, Cyclosa, Cyrtophora,* &c.

Simon (id. p. 828) was able to note several synonyms, such as :—

1. *lugubris* (Walck.)=*punctigera* (Dol.)=*manipa* (Dol.)=*triangula* (Keys.)=*indagatrix* (L. K.)=*vatia* (Thor.)=*ephippiata* (Thor.) =*paviei* (Sim.).
2. *decens* (Thor.)=*hispida* (Dol.)=*rumpfi* (Thor.)=*rufofemorata* (Sim.).
3. *nauticus* (L. K.)=*pullata* (Thor.).
4. *laglaizei* (Sim.)=*thomisoides* (Dol.)=*thelura* (Thor.).
5. *nox* (Sim.)=*pilula* (Thor.).

Undoubtedly many other synonyms exist among the specific names in the following list, for many new species have been made, especially by Thorell, on the very slender evidence of one individual only, of either sex as the case may be—and not only this, but the specimen is often frankly acknowledged as either quite immature or frequently noted as much mutilated.

The genus *Araneus* is specially rich in Tropical America and in Malaya, with some species—e. g., *nauticus*—common to both regions. *A. nauticus* is one of the most widely distributed species throughout the tropics of both Worlds, Old and New.

I have been able to collect the following species of the genus *Araneus* as reported from the Oriental Region :—

1.	*abscissa* (Karsch), 1878.	Japan.
2.	*achine* (Sim.), 1906.	Himalayas.
3.	*acrobalia* (Thor.), 1895.	Burma.
4.	*acrocephala* (Thor.), 1887.	,,
5.	*acropyga* (Thor.), 1877.	Celebes.
6.	*albertisii* (Thor.), 1887=*enucleata* (Karsch), 1879.	,,
7.	*allocephalus* (Thor.).	Burma, Celebes.
8.	*annuliger* (Thor.).	Burma.
9.	*apiculata* (Thor.), 1895.	,,
10.	*beccarii* (Thor.), 1878.	Amboina.
11.	*bilunatus* (Poc.).	Chingleput, India.
12.	*bilunifer* (Poc.), 1900.	South India.
13.	*bogoriensis* (Dol.), 1859=*de haanii* (Dol.).	Ceylon.
14.	*börneri* (Strand), 1907.	Mercara, Shanghai.
15.	*braminica* (Stol.), 1869=*theisi* (Walck.).	Calcutta.
16.	*brevipes* (Thor.) [*Milania*].	Malaya.
17.	*calciope* (Sim.), 1893.	Kodaikanal.
18.	*calyptrata* (Work.), 1894 [*Zilla*].	Burma.
19.	*camilla* (Sim.).	Himalayas.
20.	*capillatus* (Thor.).	Burma.
21.	*caput-lupi* (Dol.), 1859.	Malaya.
22.	*catillata* (Thor.), 1895.	Burma.
23.	*centrodes* (Thor.), 1887.	,,
24.	*cicatrosa* (Stol.), 1869=*Ep. salebrosa* (Thor.)=[*Cyrtophora*].	,,
25.	*citricola* (Forsk.), 1775 [*Cyrtophora*].	Burma, India.
26.	*crestata* (Thor.)=*de haanii* (Dol.), ♂.	
27.	*cribratus* (Sim.).	Himalayas.
28.	*decens* (Thor.), 1877=*hispida* (Dol.), 1859=*rumpfi* (Thor.), 1878=*rufofemorata* (Sim.), 1884.	
29.	*decentella* (Strand), 1907.	Mercara ?.
30.	*de haanii* (Dol.), 1859=*submucronatus* (Sim.), 1887.	Aru.
31.	*dönitzi* (Bös. & Strand), 1906.	Shanghai.
32.	*ejusmodi* (Bös. & Strand), 1906.	Kuriles.
33.	*elatata* (Strand).	Aru.
34.	*enucleata* (Karsch), 1879=*albertisii* (Thor.).	Burma, Ceylon.
35.	*enyoides* (Thor.), 1877.	Celebes.
36.	*ephippiata* (Thor.), 1881=*punctigera* (Dol.).	
37.	*exanthematica* (Dol.), 1859 [*Cyrtophora*]=*exanthemicus* ? (Dol.).	Celebes, Burma.
38.	*excelsus* (Sim.), 1889 [*Glyptogona*].	Himalayas.
39.	*feæ* (Thor.), 1887 [*Euetria*].	Burma.
40.	*ferruginea* (Thor.), 1877.	Celebes.
41.	*flava* (Vins.), 1863.	Mauritius.

42. *gestrella* (Strand), 1906.	Halmahera.
43. *gibber* (Camb.).	
44. *goniæa* (Thor.).	Malaya.
45. *hampei* (Sim.), 1893]	Java.
46. *hemicræra* (Thor.), 1890.	Penang.
47. *himalayanus* (Sim.).	Himalayas.
48. *hispida* (Dol.), 1859.	Burma, Celebes, Ceylon.
49. *hybophora* (Thor.), 1887 [*Cyclosa*].	Burma.
50. *incertus* (C. K.).	Malaya.
51. *indagatrix* (L. Koch) = *punctigera* (Dol.).	Burma, Celebes.
52. *inustus* (L. K.) = *weyersi* (Sim.).	
53. *kandarensis* (Thor.), 1877 = *de haanii* (Dol.).	Celebes.
54. *laglaizei* (Sim.), 1877 = *thomisoides* (Dol.), 1857 = *thelura* (Thor.), 1878.	Burma, Ceylon.
55. *latirostris* (Thor.), 1895.	Burma.
56. *leucogaster* (Thor.), 1895.	"
57. *lixicolor* (Thor.), 1895.	"
58. *longicauda* (Thor.), 1877.	Celebes.
59. *macrura* (Thor.), 1877 = [*Cyclosa*] *bifida* (Dol.).	"
60. *mangareva* (Walck.), 1847 = *theisii* (Walck.).	Ternate
61. *manipa* (Dol.), 1857 = *punctigera* (Dol.).	
62. *masoni* (Sim.), 1887.	Burma
63. *melanocrania* (Thor.), 1887 [*Zilla*].	"
64. *mellotteei* (Sim.), 1893.	Japan.
65. *mertoni* (Strand), 1911.	Aru.
66. *metalis* (Thor.), 1887.	Burma.
67. *metella* (Strand), 1907.	Shanghai.
68. *minutalis* (Sim.).	Ceylon, Himalayas.
69. *mitifica* (Sim.), 1886.	Burma.
70. *modestus* (Thor.).	"
71. *moluccensis* (Dol.), 1857 [*Euetria*].	Celebes.
72. *monoceros* (Thor.), 1895 = *laglaizei* (Sim.), ♂.	Burma.
73. *morula* (Thor.).	"
74. *myura* (Thor.), 1877.	Celebes.
75. *myrrheus* (Sim.), 1893.	Trichinopoly.
76. *nautica* (L. Koch), 1875 = *pullata* (Thor.).	Aru, Burma.
77. *nigricauda* (Sim.).	Indo-China.
78. *noegeata* (Thor.), 1895.	Burma.
79. *nox* (Sim.), 1877 = *pilula* (Thor.), 1877.	"
80. *noxella* (Strand).	Halmahera.
81. *nympha* (Sim.).	Himalayas.
82. *oatesii* (Thor.), 1892 [*Cyclosa*].	
83. *obtusata* (Karsch), 1891.	Ceylon.
84. *odites* (Sim.), 1906.	Himalayas.
85. *opima* (L. Koch), 1877.	Japan.
86. *oxyura* (Thor.), 1877 = *raphanus* (Thor.).	Burma.
87. *papula* (Thor.).	"
88. *papulata* (Thor.), 1887 = *petax* (Thor.), 1890.	"
89. *pauxilla* (Thor.), 1887.	"
90. *pavidus* (Sim.), 1906.	Himalayas.
91. *paviei* (Sim.), 1886 = *punctigera* (Dol.) ?.	
92. *perfissa* (Thor.), 1895 [*Cyrtophora*].	Burma.
93. *pfeifferæ* (Thor.), 1877.	Celebes.
94. *phyllonota* (Thor.), 1887.	Burma.
95. *pilula* (Thor.) 1877 = *nox* (Sim.), 1877.	Celebes.
96. *pinguis* (Karsch), 1878.	Japan.

97. *præsignis* (L. Koch).	
98. *psylla* (Thor.), 1887.	Burma.
99. *pullata* (Thor.), 1877=*nautica* (L. K.), 1875.	
100. *postilena* (Thor.), 1878.	Amboina.
101. *punctiger* (Sim.).	Himalayas.
102. *punctigera* (Dol.), 1857.	Ceylon, Celebes.
103. *radja* (Dol.), 1857.	Amboina.
104. *radleyi* (Sim.).	Ceylon, India.
105. *raphanus* (Thor.), 1887.	Celebes.
106. *rostratus* (Thor.).	Burma.
107. *rubrivitticeps* (Strand), 1911.	Amboina.
108. *rufofemorata* (Sim.), 1884=*rumpfi*.	
109. *rumpfi* (Thor.), 1878=*hispida* (Dol.).	Burma, India.
110. *salebrosa* (Thor.), 1878=[*Cyrtophora*] *cicatrosa*=[*Euetria*].	Amboina.
111. *sculptilis* (L. Koch), 1872.	Australia.
112. *scutulifera* (Thor.).	Burma.
113. *scylla* (Karsch), 1879.	China.
114. *senta* (Karsch), 1878.	Japan.
115. *serrata* (Thor.), 1890=[*Cyrtophora*] *unicolor* (Dol.).	
116. *sia* (Strand), 1906.	Japan.
117. *soronis* (Thor.), 1890=*enucleata* (Karsch).	
118. *sponsa* (Thor.), 1887.	India.
119. *stella* (Karsch), 1878.	Japan.
120. *stigmatisata* (Karsch), 1878=*Cyrt. unicolor*.	Ceylon.
121. *submucronatus* (Sim.), 1887=*de haanii* (Dol.).	
122. *theisii* (Walck.), 1841=*braminica* (Stol.).	Seychelles, India.
123. *thelura* (Thor.), 1878.	Burma.
124. *thomisoides* (Dol.), 1857.	
125. *tomoxeles* (Thor.).	Burma.
126. *transversivittigera* (Strand), 1907.	Shanghai.
127. *triangula* (Keys.), 1863=*punctigera* (Dol.).	
128. *triangulifera* (Thor.), 1877=*theisii* (Walck.).	Celebes.
129. *trifasciatus* (Thor.).	Malaya.
130. *trigonophora* (Thor.), 1887.	Burma.
131. *unicolor* (Dol.), 1857 [*Cyrtophora*?].	Burma, Halmahera.
132. *vatia* (Thor.), 1877=*punctigera* (Dol.).	Celebes.
133. *velvania* (Thor.).	Burma.
134. *ventricosa* (L. K.), 1877.	China, Japan.
135. *virgunculus* (Thor.).	Malaya.
136. *vulvaria* (Thor.).	Burma.
137. *wokama* (Strand), 1911.	Aru.

The genus *Araneus* (Clerck)=*Epeira* (Walck.) and of most authors. Most of the specific names given above agree with *Epeira*.

To the above list must be added :—

138. *anseripes* (Walck.), 1841=*Cyrt. melanura*.	Penang.
139. *spectabilis* (Dol.), 1859=*de haanii*.	
140. *melanura* (Sim.), 1877 [*Cyrtophora*].	Philippines.
141. *margaritacea* (Dol.), 1857=*moluccensis*.	
142. *doriæ* (Thor.), 1881.	New Guinea.
143. *viridipes* (Dol.), 1859=*nephilina*.	
144. *nephilina* (L. K.), 1871.	Australia.

145. *producta* (L. K.), 1867.	
146. *rani* (Thor.), 1881.	Austro-Malaya.
147. *arfakiana* (Thor.), 1881.	New Guinea?
148. *rhombocephala* (Thor.), 1881.	Austro-Malaya.
149. *flavisternis* (Thor.), 1881.	Amboina.
150. *obesa* (Thor.), 1881.	New Guinea.
151. *gestroi* (Thor.), 1881.	″ ″
152. *bulleri* (Thor.), 1881.	″ ″
153. *camelodes* (Thor.), 1878.	Amboina.

GASTERACANTHA (Sund.), 1833.

32. *Gasteracantha brevispina* (Dol.).

Described by Doleschall, Nat. Tijdschr. Ned. Ind. xiii. p. 423 (1857).

Locality. S. Coorg (December), at 3000 ft.; no cocoons got.

33. *Gasteracantha geminata* (Fabr.).

Described by Fabricius, Sup. Ent. Syst. p. 292 (1798).

Locality. S. Coorg (December), at 3000 ft.; no cocoons obtained.

34. *Gasteracantha sororna* (But.).

Described by Butler, Trans. Ent. Soc. Lond. pt. ii. p. 155 (1873).

Found at centre of the orb-web, which had neither stabilimentum nor white dots. This, the longest and most handsome species yet recorded from India, has the side-spikes of the abdomen much longer than the others.

Locality. S. Coorg (Dec. and April); no cocoons.

The spiders of this genus *Gasteracantha* have for long keenly interested arachnologists from their quaint forms, brilliant colours, and compact hard bodies and limbs, which last enable them to be readily and easily handled and examined. It is therefore not surprising that we have at least three publications dealing with them, viz.:—

1. "A Monographic List of the Species of *Gasteracantha*," in Trans. Ent. Soc. Lond. pt. ii. (1873), by A. G. Butler.
2. "On some new and little-known Species of Araneidea, with Remarks on the Genus *Gasteracantha*," in Proc. Zool. Soc. Lond. part ii. pp. 279–293 (1879), by Rev. O. P. Cambridge.

3. 'Die Gasteracanthen des Berliner Zoologischen Museums' (1914), an excellent monograph by Prof. Dr. F. Dahl.

The following species I find recorded from the East generally:—

1. *acuminata* (Walck.), 1840=*kuhlii* (C. L. K.)=*diardi* (Dahl). Java, Sumatra.
2. *acutispina* (Dahl), 1914. Celebes.
3. *annamita* (Sim.), 1886=*leucomelæna* (Dol.). Cochin China.
4. *annulipes* (C. L. Koch), 1845=*kuhlii* (C. L. K.). Philippines.
5. *arcuata* (Fabr.), 1793. Burma, Ceylon, Java.
6. *aruana* (Thor.), 1881=*theisii* (Guér.). Amboina?.
7. *audouinii* (Guér.), 1838. Amboina.
8. *beccarii* (Thor.), 1877?. Celebes.
9. *blackwallii* (Keys.), 1863=*hasseltii* (C. L. K.). Sumatra.
10. *bleekeri* (Dol.), 1857=*audouinii* (Guér.). Amboina.
11. *bouchardi* (Sim.), 1903=*diardi* (Dahl). Sumatra.
12. *brevispina* (Dol.), 1857=*mammosa* (C. L. K.)=*mammeata* (Thor.). Amboina, India.
13. *bruijnii* (Thor.), 1881=*lunata* (Guér.). Ternate.
14. *butleri* (Thor.), 1877=*rubrospinis* (Guér.). Celebes.
15. *canningensis* (Stol.), 1869=*brevispina* (Dol.). Calcutta.
16. *centrum* (Dol.), 1857=*sturii* (Dol.)=*fornicata*. Java.
17. *circumnotata* (Sim.), 1877=*rubrispinis* (Guér.). Halmahera.
18. *clavatrix* (Walck.), 1837=*clavatrix* (Karsch), 1892=*remifera* (But.). Celebes, Ceylon.
19. *claveata* (O. P. Camb.), 1879=*clavatrix* (Walck.). Celebes.
20. *clavigera* (Gieb.), 1863. Philippines.
21. *consanguinea* (But.), 1864=*diardi* (Dahl). China.
22. *curvicauda* (Vauth.), 1824=*arcuata* (Fabr.). Java, Borneo.
23. *cuspidata* (C. L. Koch), 1837. Java.
24. *dalyi* (Poc.), 1900. Yercand, S. India.
25. *diadesmia* (Thor.), 1887=*panisicca* (But.). Burma, Andamans.
26. *diardi* (Luc.), 1833?=*fornicata*=*diardi* (Dahl), 1914. Java.
27. *dicallina* (But.), 1864=*diardi* (Dahl). Siam.
28. *doleschallii* (Sim.)=*lepelletieri*. Moluccas.
29. *doriæ* (Sim.), 1877, (Thor.), 1890. Borneo, Sarawak.
30. *eurygaster* (Thor.), 1889=*rubrospinis* (Guér.). Celebes.
31. *fabricii* (Sim.), 1899. Sumatra.
32. *falcifera* (C. L. K.), 1845=*hecata* (Walck.)=*falcigera*? (C. L. K.). Manilla.
33. *flavida* (Dol.), 1859=*mammosa* (C. L. K.). Java.
34. *flebelis* (O. P. Camb.), 1879=*frontata* (Black.). Sarawak.
35. *fornicata* (Fabr.), 1781?. Ceylon, East Indies.
36. *fornicata* (Walck.), 1840=*diardi* (Dahl). Java.
37. *frontata* (Black.), 1864. East Indies.
38. *geminata* (Fabr.), 1798. Madras, Ceylon.
39. *globulata* (Walck.), 1840=*mammosa* (C. L. K.). Java, Sumatra.
40. *guttata* (Thor.), 1860=*mammosa* (C. L. K.). Malacca.
41. *harpax* (O. P. C.), 1879=*doriæ* (Sim.). Sarawak.
42. *hasseltii* (C. L. K.), 1837. Madura, Java.
43. *hecata* (Walck.), 1837. Philippines.

44.	*helva* (Camb.), 1879=*hasseltii* (C. L. K.).	Borneo.
45.	*helva* (Black.), 1864=*hasseltii* (C. L. K.).	Siam.
46.	*hepatica* (L. Koch), 1871=*hasseltii* (C. L. K.).	Java, Sumatra.
47.	*horrens* (Thor.), 1860=*hasseltii* (C. L. K.).	Assam, Singapore.
48.	*interrupta* (Dahl), 1914.	Celebes.
49.	*irradiata* (Walck.), 1837.	Cochin China.
50.	*kuhlii* (C. L. K.), 1837.	Java, Siam.
51.	*kulczynski* (Strand), 1906=*doriæ* (Thor.).	Sumatra.
52.	*læviuscula* (Thor.), 1881=*lunata* (Guér.).	Halmahera
53.	*lepeletierii* (Guér.), 1828.	Amboina
54.	*leucomelæna* (Thor.), 1890=*kuhlii* (C. L. K.).	Poona, Kukan.
55.	*leucomelas* (Dol.), 1859=*kuhlii* (C. L. K.).	Java.
56.	*lunata* (Guér.), 1838.	Timor.
57.	*lygeana* (Walck.), 1837.	Java.
58.	*malayensis* (Sim.)=*mengei* (Keys.).	Malacca.
59.	*mammeata* (Thor.), 1860=*mammosa* (C. L. K.).	Manilla, Amboina.
60.	*mammosa* (C. L. K.), 1845.	Ceylon, Madras.
61.	*marsdeni* (Sim.), 1903=*diardi* (Luc.).	Sumatra.
62.	*martensi* (Dahl), 1914.	”
63.	*mediofusca* (Dol.), 1859=*mammosa* (C. L. K.).	Java.
64.	*mengei* (Keys.), 1863.	Malacca.
65.	*minahassæ* (Merian), 1911=*irradiata* (Walck.).	Celebes.
66.	*montana* (Thor.), 1890=*diardi* (Dahl).	Sumatra.
67.	*nebulosa* (But.), 1873=*fornicata*=*transversa* (C. L. K.).	Java.
68.	*nigrisparsa* (But.), 1873=*clavigera* (Gieb.).	Philippines.
69.	*nigristernis* (Sim.), 1899=*sturii* (Dol.).	Sumatra.
70.	*observatrix* (O. P. Camb.), 1879=*brevispina*.	China.
71.	*panisicca* (But.), 1873.	Philippines.
72.	*parvula* (Thor.), 1860=*hasseltii* (C. L. K.).	Singapore.
73.	*pavesi* (O. P. C.), 1879=*diardi* (Dahl).	Laccadives.
74.	*pavesii* (Sim.), 1895=*diardi* (Dahl).	
75.	*perakensis* (Sim.), 1901=*hasseltii* (C. L. K.).	Perak.
76.	*pictospina* (van Hass.), 1882=*hasseltii* (C. L. K.).	Sumatra.
77.	*propinqua* (O. P. C.), 1879=*hasseltii* (C. L. K.).	Cambodia
78.	*pseudoflava* (Sim.), 1877=*audouinii* (Guér.).	Halmahera.
79.	*recurva* (Sim.), 1877.	Manilla.
80.	*remifera* (But.), 1873.	India, Ceylon.
81.	*retrorsa* (Thor.).	Amboina, Moluccas.
82.	*rimata* (O. P. Camb.), 1879=*geminata* (Fabr.).	Ceylon.
83.	*roseolimbata* (Dol.), 1859=*mammosa* (C. L. K.).	Java.
84.	*rubrospinis* (Guèr.), 1838.	Celebes.
85.	*sagaënsis* (Bös. & Str.), 1906.	Japan.
86.	*sanguinea* (Dahl), 1914.	Philippines.
87.	*sauteri* (Dahl), 1914.	Formosa.
88.	*scoparia* (Sim.), 1877=*clavigera* (Gieb.).	Philippines.
89.	*sororna* (But.), 1873.	India.
90.	*sturii* (Dol.), 1857.	Amboina, Ceram.
91.	*sumatrana* (But.), 1864=*diardi* (Luc.).	Sumatra.
92.	*suminata* (L. Koch), 1871=*brevispina* (Dol.).	Fiji Is.
93.	*tæniata* (Walck.), 1840.	New Guinea.
94.	*ternatensis* (Thor.), 1881=*lunata* (Guèr.).	Ternate.
95.	*theisii* (Guèr.), 1830.	New Guinea.
96.	*tjibodensis* (Strand), 1907=*hasseltii* (C. L. K.).	Java.
97.	*tondanæ* (Poc.), 1897.	Celebes.
98.	*transversa* (C. L. K.), 1838=*fornicata*.	Java ?.
99.	*transversalis* (Walck.), 1837=*audouinii* (Guèr.).	Timor.

100. *unguicornis* (But.), 1864=*diardi* (Luc.).	India?.
101. *variegata* (Walck.), 1840.	New Guinea, Sumatra.
102. *vittata* (Thor.), 1868=*irradiata* (Walck.).	Java.
103. *wallacei* (Thor.), 1881.	Andai.
104. *crepidophora* (O. P. Camb.), 1879.	New Guinea.
105. *unguifera* (Sim.), 1889.	Himalayas.
106. *prætextata* (Dol.), 1859=*hasseltii.*	

Thomisidæ.

THOMISUS (Walck.), 1805.

35. *Thomisus pugilis* (Stol.).

Described by Stoliczka in "Contribution towards the Knowledge of Indian Arachnoidea," in Journ. Asiat. Soc. Bengal, vol. xxxviii. pt. ii. no. 4, pp. 225–227 (1869).

Almost white spiders, found on leaves usually with the cocoons concealed under the curled-over edge of the leaf, or on flower-heads, especially those of *Calotropis gigantea.*

Locality. Common on Madras Beach; "Monte Cristo" Estate, Nawalapitiya, Ceylon. Previously reported from Madras, Calcutta, and also Peradeniya.

36. *Thomisus laglaizei* (Sim.) =*javanus* (Thor.).

Described by Simon in Ann. Soc. Ent. France, 2 ser. vii. p. 65 (1877).

Very similar to the above.

Locality. Madras Beach.

The males of the above two species are minute brownish spiders of one hue often on the flower-heads of *Calotropis gigantea.*

37. *Thomisus stoliczkæ* (Thor.)=*T. histrionicus* (Thor.).

Described by Thorell in Ann. Mus. Gen. xxv. p. 271 (1887); *T. histrionicus* (Thor.) described in 'The Spiders of Burma' (1895), pp. 292–294.

Much more handsome than the above two species, with very distinct markings.

Locality. S. Coorg.

I have not found this species on the plains. It has, however, been reported previously from Burma, Ceylon, and British India.

These three species of *Thomisus* are all large, much the same size, and were formerly known under the generic name of *Daradius* (Thor.). I place my specimens meantime under these species after comparison with those in the British Museum Collection, London.

Reported from the East generally I find :—

1.	*amadelphus* (Sim.), 1908.	Tonkin.
2.	*annulipes* (Thor.), 1872 [*Pistius*].	Celebes.
3.	*armillatus* (Thor.), 1892 [*Daradius*].	Nicobars.
4.	*bipunctatus* (Thor.), 1877 [*Pistius*].	Celebes.
5.	*callidus* (Thor.), 1890 [*Daradius*].	Ceylon, Sumatra.
6.	*castaneiceps* (Sim.), 1908.	Tonkin.
7.	*dentiger* (Thor.), 1887.	Burma.
8.	*duriusculus* (Thor.), 1877.	Celebes.
9.	*formosæ* (Strand), 1907.	Formosa.
10.	*galeatus* (Sim.), 1908.	Tonkin.
11.	*granulifrons* (Sim.), 1906 [*Daradius*].	India, Ceylon.
12.	*histrionicus* (Thor.), 1895 [*Daradius*] = *stoliczkæ* (Thor.).	Burma, Ceylon.
13.	*javanus* (Thor.), 1890 = *laglaizei* (Sim.) ?.	Java.
14.	*labefactus* (Karsch), 1881 ?.	Japan.
15.	*laglaizei* (Sim.), 1877.	Philippines.
16.	*leucaspis* (Sim.), 1906.	South India.
17.	*melanostictus* (Sim.), 1908.	Tonkin.
18.	*onustoides* ? (Bös. & Str.), 1906.	China, Japan.
19.	*perspicillatus* (Thor.), 1890 [*Daradius*].	Sarawak.
20.	*picaceus* (Sim.), 1908.	Tonkin.
21.	*pugilis* (Stol.) [*Daradius*].	Calcutta.
22.	*retirugus* (Sim.), 1908.	"
23.	*rigoratus* (Sim.), 1906.	Coromandel, Nilgiris.
24.	*spinifer* (Camb.), 1872 = *citrinillus* (Sim.), 1879 ?.	India.
25.	*stoliczkæ* (Thor.), 1887 [*Daradius*].	Burma.
26.	*swatowensis* (Strand), 1907.	China.
27.	*variabilis* (Thor.), 1897 [*Daradius*].	Burma.
28.	*daradioides* (Sim.), 1896 ?.	Arabia.
29.	*tuberosus* (Black.), 1864.	East Indies.

According to Simon (Hist. Nat. des Araig. i. pp. 1021–1023) the above species come under the one genus of *Thomisus*.

DIETA (Sim.), 1880.

38. *Dieta virens* (Thor.).

Described by Thorell as *Orus virens* in Kongl. Sv. Vet.-Akad. Handl. xxiv. 2, p. 91 (1891), from Ceylon at Kandy. Found on the leaf of an *Eucharis* lily ; pale green spider when alive with lighter markings on the legs ; head has a brownish mark ; no web noted.

Locality. "Monte Cristo" Estate, Nawalapitiya, Ceylon. Previously recorded from Singapore, Malaya, North Australia, and Ceylon. According to Simon (Maindron Voyage) *Diæa tenuis* (L. Koch) is probably a synonym.

The following species are recorded from our area :—

1. *chlorion* (Sim.), 1906.	Madura, Nilgiris.
2. *japonica* (Bös. & Str.), 1906.	Japan.
3. *parallela* (Sim.), 1880.	Peking.
4. *subvirens* (Strand), 1907.	Ceylon
5. *virens* (Thor.), 1891 [*Orus*].	Singapore ; Ceylon.
6. *placata* (O. P. Camb.), 1899.	Ceylon.

LYSITELES (Sim.), 1893.

39. *Lysiteles catulus*? (Sim.).

Described by Simon, Ann. Soc. Ent. Belg. t. xxxix. (1895). My specimen greatly resembles this species, but agrees with Simon's specimens from Sikkim (*cf.* Hist. Nat. des Araig. vol. i. p. 998).

Locality. Ceylon, "Craighead Estate," Nawalapitya. Reported previously by Simon from Gengi, Madura, and Kodaikanal, all in South India.

This spider was found on the leaf of a maiden-hair fern ; head and legs green, with the abdomen dorsally cream-coloured with brown markings.

TMARUS (Sim.), 1875.

40. *Tmarus fasciolatus*? (Sim.).

Described by Simon, "Voyage de M. Maindron," in Ann. Soc. Ent. France (1906).

My specimens come very near this species and are the same as an undetermined lot in the Simon Collection, Paris, collected at Kandy, Ceylon.

Locality. Ceylon and also the Nilgiris. Simon reports this species from Gingi and the Coromandel coast, but also from the Nilgiris at Coonoor.

The following species of this genus are known from the East :—

1. *eques* (Thor.), 1890.	Java.
2. *fasciolatus* (Sim.), 1906.	Nilgiris.
3. *latifrons* (Thor.), 1895.	Burma.
4. *loriæ* (Thor.), 1890.	Penang.
5. *pulchripes* (Thor.), 1894.	Singapore.
6. *semiroseus* (Sim.), 1908.	Tonkin.
7. *soricinus* (Sim.), 1906.	Nilgiris.
8. *tonkinus* (Sim.), 1908.	Tonkin.

DIÆA (Thor.), 1869.

41. *Diæa* sp.?.

Resembles very much an undetermined species of Simon's in his collection from Maturata, Ceylon.

Locality. Ootacamund, Nilgiris.

The following species of *Diæa* are reported from the East:—

1.	*bitæniata* (Thor.) [*Misumena*], 1878.	Amboina.
2.	*cimicina* (Thor.), 1881.	"
3.	*concinna* (Thor.), 1877.	Celebes.
4.	*fuscus* (Thor.), 1877 [*Tharrhalea*].	"
5.	*graphica* (Sim.), 1882.	Aden.
6.	*insignis* (Thor.), 1877.	Celebes.
7.	*nitida* (Thor.), 1877 [*Misumena*].	"
8.	*pougneti* (Sim.), 1885.	India.
9.	*subadulta* (Bös. & Str.), 1906.	Japan.
10.	*zonura* (Thor.), 1890.	Penang.
11.	*jucunda* (Thor.), 1881.	New Holland.
12.	*kochii* (Thor.), 1877.	Japan.

Simon (Hist. Nat. des Araig. i. p. 1033) notes the difficulty of getting the number of species within this very wide-spread genus because of their being reported to other genera.

Diæa pougneti (Sim.), the only species on the list recorded from India, is described by Simon in a paper, "Arachnides rec. à Collegal district de Coimbatore par M. A. Theobald," published in the Bull. Soc. Zool. de France, 1885. Unfortunately his description is based on a single immature individual. Since I possess but a single specimen myself, I prefer to postpone complete identification at present.

XXI.—*Notes on some Cladocera from the New Hebrides.*

By PENELOPE M. JENKIN.

THE material was collected from the lake in Gaua by Dr. J. R. Baker during an expedition made to the New Hebrides under the Percy Sladen Trust. Most of the collections were taken with a small tow-net hauled horizontally at the surface, and these contained only one Cladoceran—*Diaphanosoma sarsii*, a typically planktonic form. In other collections, in which the tow-net was allowed to fish deeper, as well as in those made with a hand-net by the shore, three other species were found. These typically occur among aquatic vegetation, and were probably strays disturbed from some such resting-place by the collecting methods indicated.

There were no Cladocera in the plankton taken with the large tow-net. The material was well preserved in formalin, and I should like to thank both Dr. Baker for the opportunity which he has so kindly given me of examining it and the authorities of the British Museum (Natural History) for affording me facilities for its identification.

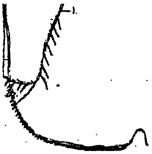
List of Species.

Diaphanosoma sarsii, Richard.
Alonella diaphana (King). One specimen only.
Dunhevedia crassa (King). Two specimens.
Chydorus sphæricus (O. F. Müller). One specimen.

Diaphanosoma sarsii, Richard.

1894. Richard, J., "Entomostracés recueillis dans le lac Toba (Sumatra)," Ann. de Mus. civ. d. Storia Naturale, Genoa, ser. 2, xiv. p. 505, figs. 4 & 5.
1901. Sars, G. O., "Freshwater Entomostraca from S. America," Arch. f. Math. og. Naturvid. xxiii. 3, p. 10, pl. ii. figs. 1–10.

This species was comparatively abundant in the plankton and agreed well with the type in most respects. The species seems to show a certain variation in the size and arrangement of the spines on the ventral posterior border of the carapace. The present specimens show an arrangement (fig. 1) similar to that figured by Richard in his specimens from Sumatra. It is possible that this is a local variation between the Australasian and S. American forms. The species is also recorded from India (*Gurney*) *, Ceylon (*Bär*) †, and the Aru Archipelago (*Früchtl*) ‡.



Diaphanosoma sarsii, Richard.
P.=posterior border of carapace; V.=ventral; I.=inflexed.

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* 1907, Gurney, R., "Further Notes on Indian Freshwater Entomostraca," Rec. Ind. Mus. i. p. 24.

† 1924, Bär, G., "Ueber Cladoceren von der Insel Ceylon," Jenaische Zeit. Naturw. lx. p. 87.

‡ 1925, Früchtl, F., "Die Cladoceren u. Copepoden-Fauna des Aru Archipels," Arb. Zool. Inst. Univ. Innsbruck, ii. p. 29.

The species occurred in nearly all the hauls taken with the small tow-net.

Two interesting points may be mentioned. Firstly, whereas the total plankton showed two maxima, at 11.0 A.M. and 9.30 P.M. respectively, *Diaphanosoma* was really abundant only at the latter time; secondly, this greater abundance was chiefly due to a great increase in the number of mature animals. The only other surface-haul in which adults were present was that at 3.30 P.M., when only a few were taken. This seems definitely to indicate a diurnal migration, at least of the adults, of this species—a migration such as is well known for the northern species of the genus.

Alonella diaphana (King).

1852. King, "On Australian Entomostraca," Papers & Proc. Roy. Soc. Van Diemen's Land, ii. pt. 2, p. 360, pl. viii. c.

1888. Sars, G. O., "Some Additional Cladocera raised from Australian Mud," Forh. Vidensk. Selsk. Christiania, no. 7, p. 47, pl. v. figs. 3–7.

The identification of this species is uncertain, as the only specimen (♀) found in the collections was damaged in mounting. The first antennæ seemed to be slightly shorter than in the type, and the dorsal posterior corner of the abdomen showed a slight angle, whereas in the form described by Sars under this name and identified by him with King's species the corner was quite rounded off.

The specimen occurred in a collection taken with a bolting silk hand-net close to the shore on June 2nd, 1927.

The species has been chiefly recorded from Australasia *.

Dunhevedia crassa, King, Sars.

1852. King, *loc. cit.* p. 261, pl. vii. F.

1888. Sars, G. O., *loc. cit.* p. 42, pl. v. figs. 1–4.

The two specimens of this species from Gaua agree closely with the description and figures given by Sars (1888), who separates it later (1916) † from *D. setigera* (Birge) ‡ on the grounds of the lack of distinct sculpturing of the valves in the former.

One specimen was found in the same collection as the foregoing species, the other in a haul made on June 3rd, 1927, with the small tow-net "started deep"—a fact which probably accounted for the presence of this stray specimen in the plankton.

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* 1927, Gurney, R., "Some Australian Freshwater Entomostraca reared from Dried Mud," Proc. Zool. Soc. London, p. 74, fig. 8, *c* & *d*.

† 1916, Sars, G. O., "Freshwater Entomostraca of Cape Province.—Cladocera," Ann. S. African Mus. xv. 4, p. 343, pl. xli. figs. 3, 3*a–c*.

‡ 1877, Birge, E. A., "Notes on Cladocera," Trans. Wins. Acad. Sci. iv. pp. 100–102, pl. i. fig. 18.

The species is fairly widely distributed, being certainly recorded from Australia and S. Africa. Gurney (1909)* gives an even wider distribution for it, but he does not separate it from the American form.

Chydorus sphæricus (O. F. Müller).

1785. Müller, O. F., 'Entomostraca seu Insecta testacea etc.,' p. 71, pl. ix. figs. 7–9.

1900. Lilljeborg, W., 'Cladocera Suecicæ,' p. 561, pl. lxxvii. figs. 8–25.

The presence of this ubiquitous species is interesting if only as affording another example of the amazing powers of distribution possessed by Cladocera. The single specimen found in the collections from Gaua appeared to differ in no marked way from the type. It occurred in plankton taken with the small tow-net, weighted.

XXII.—*Exotic* Muscaridæ (*Diptera*).—XXVII. By J. R. Malloch, Bureau of Biological Survey, Washington, D.C.

Family Chloropidæ.

Genus STENOSCINIS, Malloch.

This genus was erected by me for the reception of *Oscinis longipes*, Loew, a North American species. In 1918 Mr. C. G. Lamb described a species from Africa which is an absolute homonym of the genotype, and peculiarly enough it belongs to the same genus. It thus falls to me, in recording the occurrence of this species in material submitted for identification, to assign to it a new name as below.

Stenoscinis arnos, nom. nov.

Oscinis longipes, Lamb, *nec* Loew, Ann. & Mag. Nat. Hist. (9) i. p. 395 (1918).

This species has the same characters as the genotype, but even more accentuated, the anal angle of the wing undeveloped so that the anal field is widest below middle of the discal cell, the legs long and slender, the anterior notopleural bristle undeveloped and only one of the posterior pair evident, and the frontal triangle very broad, with a blunt extremity on anterior margin of frons. In his description Lamb indicated that the species might yet be accorded generic rank.

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* 1909, Gurney, R., "Freshwater Crustacea of Algeria and Tunisia." Journ. Roy. Micr. Soc. p. 292.

It is noteworthy that in my specimen the mesonotum is not totally glossy black, being grey-dusted in centre of the hind margin, as is also the centre disc of the scutellum.

Length 3 mm.

Locality.—Umtali, S. Rhodesia, 27 September (*A. Cuthbertson*).

In giving this species a new name I dedicate it to the original describer.

Genus STELEOCERUS, Becker.

This genus is readily distinguished from others in the subfamily Chloropinæ by the thickened, sword-like arista, which is almost nude, and the slender legs.

Steleocerus lepidopus, var. *apicalis*, nov.

A female agreeing very well with the description of *lepidopus*, Becker, is before me from Salisbury, S. Rhodesia, x. 1928 (*A. Cuthbertson*).

It has, however, a quite distinct brownish cloud at apex of wing in the submarginal cell; the fore tibiæ and tarsi are deep black, and there is no dark mark on the fore femur.

Length 5·5 mm.

I give to this form a varietal name, but it is possible it is a distinct species. More material is required to dermine the status of the insect.

Family Drosophilidæ.

Genus LISSOCEPHALA, nov.

This genus is quite similar to *Drosophila*, Fallén, differing essentially in having the entire frons glossy, uniform in texture, and slightly projecting, eaves-like, over the bases of the antennæ. Postverticals short, all verticals well developed, ocellars long, posterior reclinate and proclinate orbitals quite strong, anterior reclinate, orbital microscopic, between the others; face carinate; arista plumose. Thorax with two pairs of postsutural dorsocentrals, no prescutellar acrostichals, four scutellars, and two sternopleurals. Wings as in fig. 1, the second vein much as in some species of the genus *Chymomyza*, Czerny, gradually approaching costa and not curved forward at apex; no cross-vein separating posterior basal and discal cells; costa to apex of fourth vein; anal cell complete. Legs normal.

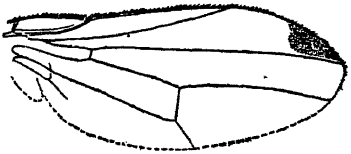
Genotype, the following species.

Lissocephala unipuncta, sp. n.

Female.—Head, thorax, legs, and halteres, shining fulvous-yellow, face a little paler; abdomen glossy blue-black, with coppery or purple reflections apically; wings hyaline, veins pale, apex of first vein and costa before that point darker, a rather large fuscous spot on costa at apex of submarginal cell extending basally about midway to apex of second vein (fig. 1).

Frons about 1·5 as wide at vertex as long in centre, slightly convex, bare; facial carina well developed, slightly flattened; third antennal segment about twice as long as wide; eyes without evident hairs; cheek not as high as width of third antennal segment. Thorax with eight quite regular series of intradorsocentral hairs, two humerals, scutellum flattened above, slightly margined, apical bristles cruciate. Abdomen tapered to apex. Mid-tibia with one apical ventral spur.

Fig. 1.



Lissocephala unipuncta, wing.

Length 2·75 mm.

Type, Salisbury, S. Rhodesia, 18. iv. 1927, under fig-tree; one paratype, same locality, labelled "Bred figs," iv. 1927 (*A. Cuthbertson*); no. 108*f*.

Genus ZAPRIONUS, Coquillett.

This genus is readily distinguished from any in the family by the peculiar armature of the anteroventral surface of the fore femur in both sexes, which consists of a series of slightly flexed spines set on elevated bases.

Zaprionus vittiger, Coquillett.

This species, which is the genotype, is fulvous-yellow in colour, with a pure white line along each frontal orbit, which connects with a similar one on each side of disc of mesonotum that continues along side of scutellum to apex, and another such line along the notopleural margin, all of which lines are narrowly margined with black; sometimes there is another, but fainter, white line along the middle of the pleura. Wings hyaline.

Proclinate orbital well in front of anterior reclinate orbital, the latter usually well developed; frons narrowed in front, longer than wide, facial carina quite prominent. In other respects similar to typical species of *Drosophila*, Fallén.

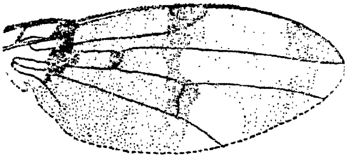
Locality.—Salisbury, S. Rhodesia, 16. i. 1922, labelled "No. 1173, fruit" (*A. Cuthbertson*).

Genus LEUCOPHENGA, Mik.

Leucophenga cuthbertsoni, sp. n.

Male.—Pale straw-yellow, frons, dorsum of thorax and scutellum, and dorsum of abdomen, densely silvery-white dusted; legs straw-yellow, halteres white, wings greyish hyaline, marked as in fig. 2, a mark beyond the complete dark fascia and one in apices of first and second posterior cells whitish hyaline.

Fig. 2.



Leucophenga cuthbertsoni, wing.

Frons fully twice as long as wide, almost parallel-sided, postverticals and ocellars short and fine; all three orbitals quite long, the anterior reclinate and proclinate bristles at same point, a few fine hairs on interfrontalia and orbits anteriorly; third antennal segment over twice as long as wide; cheeks linear; palpi slender. Venation as in fig. 2, the apical section of costa with about three minute warts on its underside.

Length 2·25 mm.

Type, Salisbury, S. Rhodesia, 27 June (*A. Cuthbertson*); no. 162.

Named in honour of the collector, who has sent me many interesting Diptera from Africa.

Family Sarcophagidæ.

I have received from Dr. G. A. K. Marshall a number of specimens of the genus *Sarcophaga* from Africa with a request for early identifications, and herein publish the desired information with some notes on other species.

But few of the species of the genus described from this continent by the old authors are identifiable, which is unfortunately also the case with species of the genus from other faunal regions, and without very careful examinations of the type-specimens, including the male hypopygia, it is impossible to recognize any but the most conspicuously differentiated forms. It is thus highly probable that some of the more recently described species may prove to be synonyms of those of earlier describers. Notwithstanding this probability, both with those just referred to and others that cannot be identified with them, it would appear imperative to describe the latter so that definite names may be available for them in literature dealing with the economy or distribution of such species. I therefore describe below two species which I have been unable to associate with any described species.

Both of the species are similar to *angelicæ*, Engel, described from Cape Colony*, possessing three pairs of postsutural dorsocentrals, and bristles on the basal half of upper surface of the first wing-vein. The two before me have the centre of the propleura hairy, but Engel makes no mention of this character in *angelicæ*, and he states that the mid-femur has a comb (apical posteroventral), which is not the case in either of the species now under discussion. All three have the hypopygia orange-red, though Engel states that the basal genital segment in his type is hidden.

In describing the new species I have used all the above characters and figured the hypopygia, at the same time making use of reproductions of those portions of Engel's figures of the hypopygium of *angelicæ* which show differences from those of the new species.

A number of the North American species of the genus are parasitic upon grasshoppers, which habit is recorded for the species now described from Africa.

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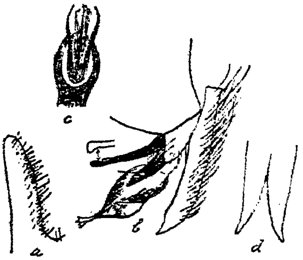
* Bull. Soc. Roy. Ent. d'Egypte, p. 334, 1924 (1925).

Sarcophaga benefactor, sp. n.

Male.—Head black, with dense pale grey dusting, that on the parafacials changeable according to the angle from which it is viewed; antennæ and palpi black. Thorax black, with dense pale grey dusting, mesonotum with five black vittæ, the median one contiued over the scutellum, the outer one on each side incomplete. Abdomen black, ochreous-yellow from near base of fourth visible tergite to tip, including the hypopygium, the dusting grey at base, becoming yellowish on sides and apically. Legs black. Wings greyish hyaline. Calyptræ white. Halteres dusky yellowish.

Frons at vertex about one-fifth of the head-width, narrowed centrally, widened in front, inner verticals long, outer pair small, ocellars short and fine, each orbit with about seven anterior incurved bristles and one upper backwardly curved bristle, the latter usually strongest; parafacial wider than third antennal segment, with one series of hairs close to eye, which become longer below. Thorax with three pairs of postsutural dorsocentrals, a fine pair of prescutellar acrostichals, sternopleurals 1 : 1 : 1, scutellum with two long bristles on each side, a short pair of apicals, and a similar pair of subapical discals. Abdomen without apical central bristles on second visible tergite, third and fourth each with apical bristles; fifth sternite as in fig. 3 *a*, hypopygium not above the average in size, as in fig. 3. Legs normal, midfemur with the apical third of posteroventral surface lacking strong bristles; neither mid nor hind tibiæ with exceptional hairing, the former with a strong submedian ventral bristle,

Fig. 3.



Sarcophaga benefactor, male. *a*, fifth sternite, one side from below; *b*, hypopygium from the side; *c*, apex of penis from below; *d*, apices of superior forceps from behind.

the hind tibia with one or two anteroventral bristles ; hind femur with two partial dorsal series of bristles centrally, the anteroventral and posteroventral bristles not closely placed, the same surfaces with some long hairs which are quite sparse. First with vein bristled on basal half above, third with short bristles from base to near the inner cross-vein on upper surface.

Female.—Similar to the male in colour, the entire apex of abdomen from base of fourth visible tergite reddish orange, and the sides and apex with the yellow tint of dusting even more pronounced than in the male.

The frons is wider than in the male, with two forwardly-directed outer orbitals on each side, and the outer vertical bristles are about half as long as the inner pair. The apical scutellar bristles are lacking, but in other respects the thorax is as in the male.

Length 7–9 mm.

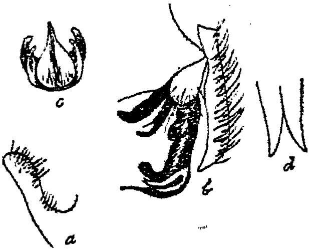
Type, male, allotype, and 16 paratypes, Moshi, Tanganyika Territory, 1929 (*A. H. Ritchie*). Reared from *Schistocerca gregaria.*

Group-characters linking this species with the next one are the setulose first vein of the wing, the posteriorly haired prosternal plate, centrally haired propleura and postalar declivity, and the presence of hairs below the lower calypter on metanotum. In addition, the three pairs of postsutural dorsocentrals and lack of long fine hairs on the tibiæ may be taken as of value in minor degree.

Sarcophaga destructor, sp. n.

Male.—Very similar to the foregoing species, but the dusting over all is not so decidedly whitish grey, but more yellowish grey, being more uniform on the abdomen, which latter is not so extensively yellowish at apex in the female,

Fig. 4.



Sarcophaga destructor, male. Lettering as in fig. 3.

Structurally the species are also very similar, being distinguishable only by the characters of the fifth abdominal sternite and hypopygia of the male (fig. 4).

Length 6–9 mm.

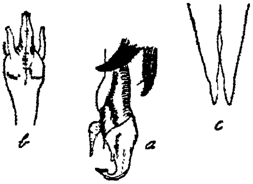
Type, male, Kassalla, Sudan, 11. xii. 1923 (*H. H. King*), bred from locust; allotype, one female, and two male paratypes, Khartoum, 14. viii. 1927, bred from *Schistocerca gregaria* (*H. W. Bedford*).

Sarcophaga angelicæ, Engel.

I reproduce portions of the figures of the hypopygia of Engel's species for the purpose of making comparisons only (fig. 5).

Engel states that this species has a mid-femoral comb.

Fig. 5.

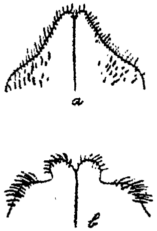


Sarcophaga angelicæ, male. *a*, penis from the side; *b*, same from below; *c*, apices of forceps from behind.

Sarcophaga taitensis, Schiner.

This species is very similar to *peltata*, Aldrich, and, if my opinion is correct, has been recorded as such from Samoa.

Fig. 6.



Sarcophaga peltata (*a*) and *taitensis* (*b*), fifth sternite from below.

The two species agree in coloration and general structure, but there is a very considerable difference in the structure of the fifth abdominal sternite of the males, and there are also some differences in the form of certain appendages of the hypopygium of that sex. I figure the fifth sternite of the two species to make the distinction clear (fig. 6).

Locality.—Papeete, Society Islands, vii. 1928, and Moorea, Society Islands, viii. 1928 (*A. Tonnoir*). Seven specimens.

Sarcophaga sternodontis, Townsend.

This species is one of the commonest of the parasitic species of the genus in tropical and subtropical America, extending from Florida through the West Indies to British Guiana and Peru.

I make mention of it here merely to draw attention to a peculiar character which it possesses that is not mentioned in the original description nor in Aldrich's more recent redescription of the species *.

This consists of a patch of dense decumbent black hairs on the apical third of the anterior surface of the hind femur. Similar patches, but of yellow hairs, occur on the mid-femur in *sinuata*, Meigen, and another Palearctic species.

The species does not belong to the same group as the two new African forms described in the present paper, having the first vein and centre of the propleura bare, and the hypopygium quite different. The mesonotum has the anterior one of the three pairs of postsutural dorsocentrals weaker than in the other two species, and usually a quite noticeable pair of acrostichals close to the suture that those species lack.

I have already identified, but not recorded, specimens of this species sent me by Dr. G. A. K. Marshall from British Guiana.

XXIII.—*A Comparative Study of the Otoliths of the Neopterygian Fishes* (continued). By G. Allan Frost.

[Plate III.]

XIX. Order SCLEROPAREI †.

Suborder Scorpænoidea.

Division 1. Scorpæniformes.

In *Helicolenus percoides* (Pl. III. fig. 1), of the family Scorpænidæ, the sagitta is of the Percid type, the shape being ovate and curved, with the outer side concave and the inner side convex. The dorsal rim is curved and is highest in its median part, the ventral rim is curved and has a slight median angle, the posterior rim is small and rounded or pointed, and the anterior rim consists of a prominent broad rostrum, no antirostrum or excisura being present. The sulcus opens on the upper part of the rostrum and resembles that of *Perca fluviatilis,* differing in the absence of a lower angle ; the ostium is depressed and the cauda is straight, and curved at the end, which is situated some distance from the posterior rim.

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* '*Sarcophaga* and Allies,' p. 265 (1916).

† The arrangement of families adopted here is that published by Regan (Ann. & Mag. Nat. Hist. ser. 8, xi. 1913, p. 169).

In *Scorpæna dactyloptera* (Pl. III. fig. 2) the otolith resembles that of *Helicolenus percoides* ; it differs in the height of the front part of the dorsal rim and in the anterior truncation of the dorsal area ; also in the straightness of the ostium, and in its extension to below the point of the rostrum.

In *Scorpæna porcus* (Pl. III. fig. 3), of the family Scorpænidæ, the otolith is curved, delicately fluted and dentated, and feather-like in shape and appearance. The sulcus is straight without angles, and enclosed by a crest of the anterior rim ; the ostium is domed, and the cauda is distended and rounded.

In *Merinthe macrocephala* (Pl. III. fig. 4), of the same family, the sagitta resembles the Labrid type in shape and in the formation of the sulcus, in which two angles of the lower margin are present. It differs in the absence of an antirostum or excisura, and in the shorter sulcus, which is about three-quarters the length of the otolith. The outer side is flat and slightly furrowed, and the inner side is convex. The ostium covers the rostrum, and the cauda is rounded and distended as in *Scorpæna porcus.*

In *Sebastes marinus* (Pl. III. fig. 5) the otolith is highly specialized, but resembles *Helicolenus percoides* and *Scorpæna dactyloptera* in the shape of the ventral area. The dorsal rim is high and dentated, and extends backward beyond the ventral part of the otolith. The posterior rim is extended in its upper part, below which is a small indentation. The ventral rim is well curved and slightly dentated, and the ventral area is grooved. The sulcus is straight ; the ostium is very shallow, and the cauda is deep and wide, and does not extend to the posterior rim.

In *Trigla hirundo* (Pl. III. fig. 6), of the family Triglidæ, the otolith is of the Labrid type ; the shape is high and slightly curved ; the dorsal rim is domed anteriorly and is oblique behind, the ventral rim is slightly curved, and both are serrated ; the posterior rim is small and irregular, the anterior rim consists of a rostrum and antirostrum, and contains a small excisura. The sulcus opens widely on the anterior rim ; it has a lower angle in a median position, and an upper angle slightly anterior to it. The ostium is wide and depressed, and the cauda is distended and situated higher than the ostium.

In *Trigla lineatus* (Pl. III. fig. 7), the sagitta resembles that of *T. hirundo* ; it differs in the position of the angles of the sulcus, the upper angle being well in front of the lower one, which is more rounded. The ostium is wide and depressed, rounded on its anterior margin, and a small excisura is present ; the cauda is enlongated, lies higher than the ostium, and has a contorted appearance.

The otolith of *Trigla cucullus* (Pl. III. fig. 8) resembles that of *T. hirundo* ; it differs in the presence of two lower angles of the sulcus situated posteriorly to the rounded upper angle, also in the large antirostrum and in the gaping excisura. In some cases the postero-ventral point of the otolith shown in the figure is absent.

In *Trigla gurnardus* (Pl. III. fig. 9) the sagitta resembles that of *T. cucullus*, especially in the presence of the two lower angles of the sulcus. It differs in the absence of an upper angle, the upper margin of the sulcus being regular and gently curved. The cauda is elevated, and extends to the posterior rim of the otolith. The posterior part of the ventral rim is indented and irregular in the example described.

In *Trigla lyra* (Pl. III. fig. 10) the otolith differs from the usual form ; the shape is ovate, the outer side concave and covered with radiating furrows, the inner side convex and furrowed above the sulcus. The dorsal rim is rounded and dentated, the ventral rim is curved and has a small median angle, the posterior rim has two small processes and an angular indentation. The anterior rim consists of a very small sharp rostrum, and an even smaller antirostrum. The sulcus is straight, and thereby differs from those of other species of the Triglidæ ; the upper angle is prolonged and pointed, and is a little behind the anterior of the two lower angles. The cauda is wide, straight, and the rounded end does not approach the posterior rim.

In *Trigla corax* (Pl. III. fig. 11) the shape of the otolith resembles that of *Trigla hirundo* generally, and the position of the cauda is the same. It differs in the absence of a rostrum, antirostrum and excisura, in the narrow curved ostium, and in the absence of angles in the sulcus.

In *Trigla aspersa* (Pl. III. fig. 12) the otolith is high and symmetrical, with median angles to the dorsal and ventral rims. In the example illustrated the opening of the sulcus is constricted, the ostium is straight and narrow, and no definite rostrum or antirostrum is present. In other specimens examined the ostium is wider, and opens on the anterior rim, the anterior prominence then forming the rostrum. The cauda is deeply excavated and distended, higher than the ostium, and there is a notch at the point of contact with the posterior rim. There are two angles in the lower line of the sulcus.

In the Japanese species, *Chelidonichthys kumu* (Pl. III. fig. 13), the sagitta resembles that of *Trigla hirundo*; it differs in the narrower sulcus, in which the upper angle is rounded, and the lower angle more obtuse.

In *Pterygotrigla picta* (Pl. III. fig. 14) the sagitta resembles that of *Chelidonichthys*, and has a single lower angle in the sulcus; it differs in the wider ostium and in the extension of the cauda to the posterior rim.

In *Lepidotrigla brachyptera* (Pl. III. fig. 15) the otolith resembles that of *Chelidonichthys*; it differs in the straighter sulcus, in which the cauda is less elevated, and in the presence of a deep excisura. There is no upper angle to the sulcus, but the single lower angle is well defined.

In *Peristedion cataphractum* (Pl. III. fig. 16) the sagitta is long and gently curved; the dorsal rim is domed, with the anterior part curved and the posterior part oblique and dentated; the posterior rim is small and rounded, the ventral rim is curved and dentated, and the anterior rim consists of a rounded rostrum and contains a small rounded excisura. The sulcus is long and straight, and has two lower angles. The upper line of the sulcus is upwardly distended above the ostium, depressed across the middle of the otolith and rises again above the cauda. The ostium is closed except for the narrow opening of the excisura; the anterior part of the cauda is straight, and the end which reaches the posterior rim is distended and rounded.

Division 2. HEXAGRAMMIFORMES.

In *Agrammus agrammus* (Pl. III. fig. 17), of the family Hexagrammidæ, the sagitta is of the Percid type and resembles that of *Scorpæna dactyloptera*; it differs in the raised and curved cauda, and in the presence of a rounded antirostrum and an excisura.

Division 3. PLATYCEPHALIFORMES.

In *Platycephalus insidiator* (Pl. III. fig. 18), of the family Platycephalidæ, the sagitta is long, narrow, and curved; the dorsal rim is very low and is highest in its posterior part, the ventral rim is slightly curved, the posterior rim consists of a prominent pointed process, and the anterior rim is perpendicular above, and below consists of a small pointed rostrum. The sulcus resembles that of *Scorpæna dactyloptera*; it differs in the slight downward trend of the cauda, and in the presence of a median angle to the lower line of the sulcus.

In *Parabembras robinsoni* (Pl. III. fig. 19), of the same family, the otolith resembles that of *Helicolenus percoides*. It differs in the irregular dorsal rim, in the presence of a small antirostrum, and also in the angle of the lower line of the sulcus.

Division 4. HOPLICHTHYIFORMES.

In *Hoplichthys langsdorfia* (Pl. III. fig. 20), of the family Hoplichthyidæ, the sagitta is oblong and highest in its anterior part; the dorsal rim is straight and rises slightly towards the front of the otolith, the ventral rim is deepest anteriorly, the hinder part is curved and passes into the posterior rim which is obtuse, and the anterior rim is irregular, crenulated, and without rostrum or antirostrum. The sulcus is connected by a narrow groove with the upper part of the anterior rim; the ostium is narrow, and the cauda is distended and has a deep angular depression in the front part.

Division 5. CONGIOPODIFORMES.

In *Congiopodus leucopæcilus* (Pl. III. fig. 21) the sagitta resembles that of *Sebastes marinus* in the shape of the rostrum and in the posterior projection of the dorsal area. It differs in the low dorsal rim, in the absence of an excisura, and in the sulcus, in which the ostium is completely divided from the small ovate cauda.

Division 6. COTTIFORMES.

In *Cottus gobio* (Pl. III. fig. 22), of the family Cottidæ, the sagitta is elongate in shape and resembles the Percid type; the dorsal rim is curved, passing into the lengthened posterior rim, the ventral rim is curved, the posterior part of the otolith is narrowed and bluntly pointed, and the anterior rim contains a small rounded rostrum, above which are two umbonations. The sulcus is straight, without angles, and extends about two-thirds the length of the otolith; it is divided from the anterior rim by the umbonations, and the end is rounded.

In *Cottus scorpius* (Pl. III. fig. 23) the shape of the otolith is ovate, resembling in outline that of *Parabembras*; it differs in the anterior rim and in the enclosed sulcus, which is without angles, and it is connected by a groove with the anterior rim. The front of the ostium and the end of the cauda are both rounded. A præsulcal area is present, and there are some serrations of the dorsal and ventral rims.

In *Cottus bubalis* (Pl. III. fig. 24) the otolith is the most generalized of the *Cottus* family, and resembles that of *Cottus gobio* in the general shape; it differs in the serrated rims, in the broader posterior part, and in the ostium, which opens on the anterior rim, no præsulcal area or umbonations being present.

In *Neophrynichthys latus* (Pl. III. fig. 25), of the family Psychrolutidæ, the sagitta is biconvex and conchoidal in shape. The outer and inner sides are ornamented with radiating furrows; the dorsal rim is rounded and serrated, the ventral rim is curved, the posterior rim is indented, and the anterior rim contains a blunt rostrum, a rounded antirostrum, and a large excisura. The sulcus is shallow and opens on the anterior rim, and the cauda is short and straight.

In *Agonus cataphractus* (Pl. III. fig. 26), of the family Agonidæ, the sagitta is ovate in outline and rather long. The dorsal rim is low and umbonated anteriorly, the ventral rim is curved, the posterior rim is rounded, and the anterior rim consists of a rounded rostrum. The sulcus is oblique, undivided, and opens on the anterior rim above the rostrum.

The otolith of *Cyclopterus lumpus* (Pl. III. fig. 27) (from a young example), of the family Cyclopteridæ, resembles those of the Triglidæ in height, but differs in the convexity of the sides. The shape is sub-circular, the rounded dorsal rim passes into the equally rounded posterior rim, and the ventral and anterior rims are curved and indented. The sulcus is enclosed and contains an upper median angle, above which is an angular depression of the dorsal area. The ostium and cauda are both shallow and distended.

Suborder DACTYLOPTERIDEA.

In *Cephalacanthus orientalis* (Pl. III. fig. 28), of the family Dactylopteridæ, the sagitta is of the Percid type and resembles generally that of *Parabembras* of the Suborder Scorpænoidea. It differs in the broader rostrum and antirostrum and small rounded excisura, in the absence of an angle to the sulcus, and in the downward inclination of the cauda.

Suborder Gastrosteoidea.

In *Gastrosteus aculeatus* (Pl. III. fig. 29), of the family Gastrosteidæ, the otolith shows little resemblance to those of the remainder of the order Scleroparei, but resembles the Scopelid type. The shape is rhomboidal and biconvex. The dorsal rim is horizontal and slightly depressed, the ventral rim is curved, passing into the oblique posterior rim, and the anterior rim is concave with a rounded rostrum. The sulcus is short, undivided, with rounded end, and opens on the anterior rim.

In the example examined of *Spinachia spinachia*, the otoliths were absent or microscopic, as frequently occurs in the Pipe-fishes, which in some features it resembles.

Summary.

The otoliths of the order Scleroparei show a strong affinity with those of the suborder Percoidea, and, although in some cases considerably modified, resemble either the Percid or the Labrid type; an exception occurs in *Gasterosteus*, in which the sagitta resembles the form of the Scopelid otoliths. In the family Triglidæ the otoliths are high in shape and present certain Labrid features, they may usually be distinguished by the contorted appearance of the sulcus, due to the uneven position of the upper and lower angles, and to the elevation of the cauda. In the families Scorpænidæ, Cottidæ, and Dactylopteridæ, the otoliths resemble the Percid type.

EXPLANATION OF PLATE III.

Order Scleroparei.

Fig. 1. *Helicolenus percoides*, × 2.
Fig. 2. *Scorpæna dactyloptera*, × 3.
Fig. 3. *Scorpæna porcus*, × 2½.
Fig. 4. *Merinthe macrocephala*, × 1½.
Fig. 5. *Sebastes marinus*, × 1.
Fig. 6. *Trigla hirundo*, × 2.
Fig. 7. —— *lineatus*, × 4.
Fig. 8. —— *cucullus*, × 2.
Fig. 9. —— *gurnardus*, × 3.
Fig. 10. —— *lyra*, × 2.
Fig. 11. —— *corax*, × 4.
Fig. 12. —— *aspersa*, × 8.
Fig. 13. *Chelidonichthys kumu*, × 3.
Fig. 14. *Pterygotrigla picta*, × 2½.
Fig. 15. *Lepidotrigla brachyptera*, × 2½.
Fig. 16. *Peristedion cataphractum*, × 2½.
Fig. 17. *Agrammus agrammus*, × 4.
Fig. 18. *Platycephalus insidiator*, 1¼.
Fig. 19. *Parabembras robinsoni*, × 2.

Fig. 20. *Hoplichthys langsdorfia*, × 3.
Fig. 21. *Congiopodus leucopœcilus*, × 3.
Fig. 22. *Cottus gobio*, × 4½.
Fig. 23. —— *scorpius*, × 2.
Fig. 24. —— *bubalis*, × 2½.
Fig. 25. *Neophrynichthys latus*, × 3.
Fig. 26. *Agonus cataphractus*, × 4.
Fig. 27. *Cyclopterus lumpus*, × 6.
Fig. 28. *Cephalacanthus orientalis*, × 4.
Fig. 29. *Gastrosteus aculeatus*, × 20.

XXIV.—*Four new South American* Curculionidæ (*Col.*).

By GUY A. K. MARSHALL, C.M.G., D.Sc., F.R.S.

Subfamily *HYPERINÆ*.

Phelypera pachiræ, sp. n.

♂ ♀. Derm black; pronotum with black scaling and the following markings formed of fulvous scales: on each side a broad outwardly-angulated stripe from apex to base, two small isolated spots in the middle of the disk, some variable spots along the apical margin, and outside the longitudinal stripes some variable patches, which are often united to the stripe so as to form an 8-shaped marking; scutellum black; elytra irregularly variegated with black and fulvous scaling; venter with yellowish-grey scaling, with two black patches on the apical margin of each ventrite on either side, and an indefinite blackish median stripe on ventrites 3 and 4 (5 and 6).

Head closely punctate, with black recumbent hairs and few pale ones on each side, the frons about as wide as the funicle. *Rostrum* stout, gradually widening from base to apex, finely and closely punctate (subconfluently in the basal half), and with an obsolescent median carina, which is more distinct in ♂. *Antennæ* with the two basal joints of the funicle subequal, 3 and 4 equal and somewhat longer than broad, 5–7 moniliform. *Prothorax* transverse, rounded at the sides, subparallel-sided from the base to the middle, thence narrowed to the apex; the base arcuate with the external angles slightly projecting outwardly, the apex truncate; the dorsum gently convex longitudinally and sloping forwards, closely and finely punctate throughout, without any median furrow or carina. *Elytra* oblong-ovate, with the shoulders prominent; the shallow striæ with distinct separated punctures, the intervals broad and almost flat. *Legs* with black scales sparsely intermingled with pale ones, except on the base half of the posterior pairs of femora, where the scales are all pale.

Length 6·6–8·4 mm., breadth 3·6–4·5 mm.

BRAZIL: Bahia, 3 ♂ ♂, 7 ♀ ♀ (*Dr. G. Bondar*).

Recorded as damaging the leaves of a tree, *Pachira insignis*.

Very closely allied to *P. schuppeli*, Boh., 1834, which is, however, a rather narrower insect with a red-brown integument; the rostrum is clothed with pale, instead of black, hairs; in the antennæ joints 3–7 of the funicle are all more or less transverse; the colouring of the pronotum is fulvous with three transverse rows each containing four blackish spots; the scutellum is pale, etc.

Subfamily *CRYPTORRHYNCHINÆ*.

Conotrachelus myrciariæ, sp. n.

♂ ♀. Derm red-brown, with rather thin narrow scaling; the head fulvous; the prothorax with mingled greyish-white and fulvous scales, and with a large indefinite subtriangular darker area in the middle of the base, on which the scales are very sparse and fulvous only; the pleuræ and front coxæ with much denser and broader whitish scales; the elytra sparsely but fairly evenly covered with narrow greyish-white scales, which become fulvous near the base and apex, and with a denser whitish transverse band on the shoulders between intervals 5 and 7; the sternum with sparse narrow pale scales, but the mesepisternum with an oblique stripe of dense, broader, creamy-white scales; the venter with very sparse, pale, short, recumbent setæ.

Head with coarse subconfluent punctures throughout; the frons narrower than the base of the rostrum and with a shallow median fovea; the eyes not completely covered in repose. *Rostrum* of ♂ moderately long and slender, longer than the pronotum, gently curved, and distinctly 5-carinate nearly to the antennæ, which are inserted quite close to the apex in both sexes; rostrum of ♀ similar, except that the carinæ are restricted to the basal half. *Antennæ* elongate, the two basal joints of the funicle equal, 3 longer than 4 and both longer than broad, 5 and 6 as long as broad, and 7 transverse. *Prothorax* slightly broader than long, rounded at the sides, widest about the middle, but little narrowed behind and with the basal angles somewhat projecting, strongly narrowed in front and with a very shallow subapical constriction; the dorsum convex, coarsely and subconfluently punctate throughout, with a low smooth carina from the apex almost to the base. *Scutellum* ovate, punctate, almost bare. *Elytra* subtriangular, 1·7 times as wide at the rectangular shoulders as the base of the prothorax, gradually narrowed from the shoulders to the apex, and shallowly bisinuate at the base; the punctures deep and distinct, gradually diminishing behind, and each containing a small, narrow, pale scale; intervals 3, 5, 7, 9 carinate throughout, 3 being the highest, 8 carinate from about one-fourth to three-fourths, and 10 for a short distance near the base. *Legs* with shallow indefinite punctation, which becomes coarse and longitudinally confluent at the base of the femora; the pale scaling fairly dense on the femora and sparse on the tibiæ; the femora with a large triangular tooth and a small distal one, the hind tibiæ of ♂ only with a double apical mucro; all the tibiæ, and especially the front pair, with the dorsal margin sinuate just before the apex, so that the apical angle projects. *Sternum*: front coxæ almost contiguous; the mesosternum between the coxæ sloping and broadly sinuate.

Length 6·0–6·3 mm., breadth 3·0–3·3 mm.

BRAZIL: Bahia, 1 ♂, 1 ♀, 1924 (*Dr. G. Bondar*).

The larvæ of this species feed in the fruits of a wild Myrtaceous tree, *Myrciaria cauliflora*.

In general facies very similar to *C. psidii*, Mshl. (Bull. Ent. Res. xiii. 1922, p. 64, pl. i. fig. 1), but in that species the carina on interval 3 is twice interrupted, the eyes are covered by the postocular lobes, the femora have only a single tooth, etc.

Genus HUARUCUS, nov.

Head not concealed by the pronotum; frons narrower than the base of the rostrum; eyes with a marginal furrow posteriorly and widely separated beneath. *Rostrum* curved; scrobes gradually sloping to beneath the rostrum at the base. *Antennæ* with the scape slender, abruptly clavate, and not quite reaching the eye; funicle 7-jointed; club elliptical, distinctly and transversely segmented. *Prothorax* with distinct postocular lobes. *Scutellum* small but distinct in ♀, but liable to disappear in ♂. *Elytra* ovate, a little wider basally than the base of the prothorax, without any trace of a humeral callus; stria 10 abbreviated. *Wings* rudimentary.

Legs approximately equal in length; femora slender, sublinear and not toothed, the hind pair not exceeding the apex of the elytra; tibiæ compressed, curved at the base, subcarinate dorsally, but without lateral carinæ, uncinate at the apex and with a double tuft of setæ at the inner apical angle, which bears a stout tooth also in the front pair only; tarsi with joint 1 a little longer than 2+3, 2 subtriangular and as long as broad, the claws free and with a basal lateral seta. *Sternum*: the pectoral canal bounded behind by the mesosternum, its apical margin not overhanging, but sloping backwards and reaching the posterior edge of the median coxæ; the metasternum shorter than the median coxæ, the metepisterna broad and parallel-sided. *Venter* with the intercoxal process ogival and as broad as a coxa; ventrite 2 (4) longer than 3 (5).

Genotype, *Huarucus cacti*, sp. n.

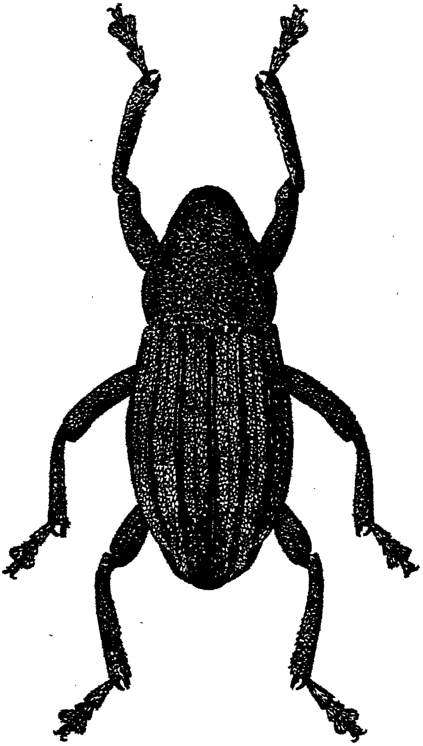
A somewhat isolated genus, which in Faust's key to the South American genera of Cryptorrhynchinæ (Stett. Ent. Ztg. 1896, p. 49) would come into the section containing *Parisacalles*, Fst., and *Echinotus*, Fst. The former differs, *inter alia*, in having toothed femora, a median projection in the base of the pronotum, the elytra with only 9 striæ, and the intercoxal process of the venter truncate. *Echinonotus* differs in having the rostrum straight and dorso-ventrally compressed, with the scrobes entirely lateral, and the pronotum concealing the head from above and with an angular emargination in the middle of the base.

Huarucus cacti, sp. n.

♂ ♀. Colour dull black, with rather thin greyish-white or pale fawn scaling above and greyish-white scales beneath.

Head with large close punctures throughout, each containing a scale. *Rostrum* gently curved, parallel-sided for the most part, but widening slightly at both base and apex, the antennæ inserted at about the middle in both sexes; dorsum in ♀ with close, but separated, punctures throughout, except laterally at the base where the punctures are coarser and confluent; dorsum in ♂ much more coarsely and confluently punctate, especially on the apical half, which is more or less subgranulate, and with a shallow longitudinal sulcus just above the scrobe. *Antennæ* with the scape almost bare and the funicle with recumbent setiform scales; the joints of the funicle in order of length: 1, 2, 3, 4, (5, 6, 7), joints 1–4 being longer than broad, 5 and 6 as long as broad, and 7 slightly transverse. *Prothorax* as long as broad in ♀

and usually slightly transverse in ♂, strongly rounded at the sides, widest well behind the middle, narrowing to the base and more so anteriorly, with a shallow subapical constriction; the basal margin truncate and twice as wide as the apex, which is gently arcuate dorsally, the postocular lobes with a dense fringe of short setæ; the dorsum gently convex longitudinally and highest in front of the middle, densely set throughout with large punctures, with only a much abbreviated median carina (sometimes obsolete); each of the dorsal punctures containing a small ovate or lanceolate scale, those on the pleuræ with much larger and mostly subcircular scales. *Elytra* narrowly ovate or subelliptical, truncate at the base, with the external angles projecting very slightly forwards, widest about the middle, jointly and obtusely rounded at the apex, and with a distinct subapical



Huarucus cacti, sp. n.

lateral constriction; the striæ shallow, containing large quadrate or transverse punctures, which are separated by narrow septa and rapidly diminish behind; the intervals narrow and each with a sparse row of indistinct punctures, intervals 3, 5, 7 carinate and much higher than the others, the lateral intervals also carinate but lower; the scales confined mostly to the sulci, leaving the higher intervals bare; the punctures on the intervals containing inconspicuous recumbent setæ. *Legs* with large shallow separated punctures containing ovate grey scales; the front tibiæ feebly denticulate internally, especially in ♂, in which they are more curved towards the apex; the tarsi densely squamose above, the clothing beneath consisting of dense blackish hairs on joints 1 and 2, but yellow and spongy on 3.

Length 4·2–6·0 mm., breadth 9·0–12·6 mm.

PERU: Huaruco, 7 ♂♂, 4 ♀♀, on cactus, 12. xii. 1928 (*R. C. Mundell*).

Type, ♂, in the British Museum; cotypes in the United States National Museum.

I am indebted to Mr. H. Morrison, of the U.S. National Museum, for the opportunity of describing this interesting species.

Subfamily *BARIDINÆ*.

Microstrates ypsilon, sp. n.

♂ ♀. Dorsum black, the lateral and apical margins of the pronotum gradually turning to red-brown; elytra, which are sometimes piceous or red-brown (? immatue), with a common basal Y-shaped patch of pale yellowish or brassy scales, which at the base extends on each elytron to stria 3, the stem of the Y reaching only to stria 1 and ending a little before the middle; the pygidium red-brown; the rostrum of ♂ black and reddish at apex, of ♀ testaceous-brown and darker at apex; the lower surface red-brown, with pale scaling that is not very dense; the legs and antennæ paler.

Head opaque, coriaceous, the frons with very shallow reticulate punctation. *Rostrum* of ♂ slightly longer than a front femur, gently curved, very gradually narrowing from base to apex, with longitudinally confluent punctation dorsally and becoming finely carinate laterally; rostrum of ♀ much narrower, almost straight, cylindrical (except for the very short basal dilatation), shiny and entirely impunctate, except for some shallow confluent punctation at the extreme base. *Antennæ* with joint 1 of the funicle nearly as long as 2 + 3 + 4, 2 being shorter than usual, 3–6 subequal and about as long as broad, 7 a little longer and broader. *Prothorax* slightly longer than broad, gently rounded at the sides, widest at about one-fourth from the base, thence much narrowed in front, with a shallow subapical constriction; the base subtruncate, with the carinate margin interrupted for a short distance in the middle; the apex half the width of the base and produced in the middle into an obtuse horn-like prominence that projects horizontally well beyond the head; the dorsum (except for an indefinite abbreviated impunctate median line) with shallow punctures separated in the middle of the disk by about the length of their own diameters, but becoming longitudinally confluent laterally and in front; the sides of the dorsum sparsely covered with small separated pale scales lying transversely; immediately below this a bare stripe, the rest of the pleuræ being sparsely squamose. *Scutellum* trapezoidal, widest behind, with a few rugose punctures. *Elytra* narrowly ovate, only slightly wider than the prothorax, flattened; the deep striæ with shallow distant punctures, the broad intervals each with a row of small rasp-like punctures, each containing a microscopic recumbent seta. *Legs* with sparse pale scaling; front tibiæ of ♂ with a long fringe of pale hairs on the lower edge, but no fringe on the femora.

Length 3·3–4·8 mm., breadth 1·2–1·6 mm.

Brazil: Bahia, 7 ♂ ♂, 9 ♀ ♀, in flowers of *Cocos coronata*, 1928 (*Dr. G. Bondar*).

The genotype, *M. cucullus*, Boh., 1844, which is the only other species known to me, is a much larger and proportionately broader insect (6 mm. by 2·5 mm.), has a longer and more elevated prothoracic process, and a dense patch of scales in the basal angles of the thorax; the elytra have only a small patch of scales at the base of interval 2, and the intervals bear numerous simple punctures; and joint 2 of the funicle is proportionately much longer, joint 1 being equal to 2+3.

XXV.—*Two Fossil Frogs from the Lower Miocene of Europe.* By H. W. Parker, B.A.

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Direct palæontological evidence with a bearing on the phylogeny or former distribution of the Salientia is, unfortunately, very scanty, and consequently every fossil frog, no matter how fragmentary or badly preserved, is worthy of the closest scrutiny. One of the most prolific sources of fossils of this group is the lignite beds, of Lower Miocene age, of Rott, near Bonn, and two specimens from this source, now preserved in the Geological Department of the British Museum and available to me through the courtesy of my colleague Mr. W. E. Swinton, seem to call for further comment.

The first of these (G.D. 30267) was originally doubtfully referred by Lydekker* to *Rana meriani*, but has more recently been made the type of a new species of the genus *Hyla* †. Critical examination and comparison shows, however, that the characters which led to its being placed in the genus *Hyla* are of very doubtful value, but that other structures can be discerned which indicate that its true position is in a different family. The characters given as diagnostic of its Hylid nature are: "arciferal, sacrum single, with greatly dilated sacral diapophyses, double condyle to coccyx, teeth in upper jaw, scapula nearly as long as procoracoid, tibiale and fibulare free, terminal phalanges claw-shaped, an intercalary present." None of these characters are in themselves diagnostic of the Hylidæ, though their sum total may be. Many of them are present beyond possibility of dispute; thus the shoulder-girdle, if one may judge from the widely separated coracoids, was probably arciferal, the sacral diapophyses were widely dilated, the coccygeal condyle was apparently double, there were teeth in the upper jaw, and the tibiale and fibulare were free.

The remaining characters, however, are by no means so well established. It is contended that the sacrum is single; the impression is single, but is ill-defined, and, even were it sharply defined, this cannot be accepted as proof that the sacrum consisted of but a single vertebra. In several present-day frogs (e. g., *Pipa pipa*, *Hymenochirus boettgeri*, and *Dendrobates typographus*) the sacrum consists of two or three vertebræ completely fused, and in *Palæobatrachus* of three, the transverse processes of two of these, or of all three, being fused to form a flat plate ‡. In all of these forms, however, the compound nature of the sacrum is indicated by the reduced number of pre-sacral vertebræ, and careful examination of the fossil gives good reason for supposing that here, also, the number of pre-sacral vertebræ is reduced. On the centre line mid-way between the coracoids and the clavicles there is a definite impression of a suture shaped like a cupid's bow, with a longitudinal suture meeting it at right angles anteriorly, and followed, posteriorly, by a depression with a slight median longitudinal ridge (fig. 1). This suture and the depression which follows it have every similarity with the impression of the first (atlas) vertebra

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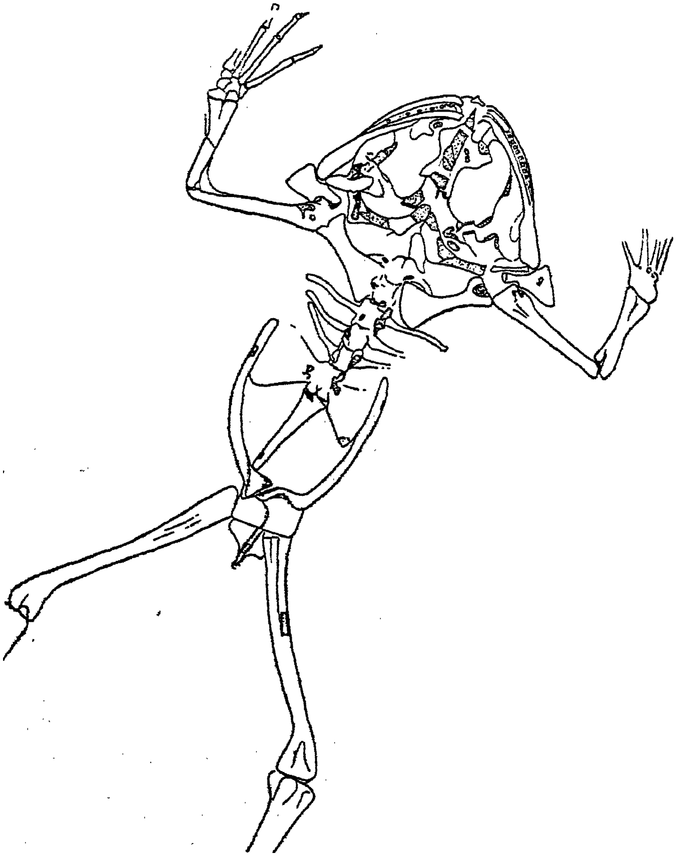
* Cat. Fossil Rept. & Amph. Brit. Mus. London, p. 123 (1890).

† *Hyla europæa*, Noble, Amer. Mus. Novit. ccciii. 1928, p. 9.

‡ Wolterstorff, Jahresber. Naturwiss. Verein Madgeburg, 1885, p. 30 (1886).

Fig. 1.



Anterior portion of type-specimen of *Lithobatrachus europæus* (Noble).

and the atlanto-occipital articulation in other frogs, particularly such forms as *Xenopus* and *Pipa*. That this is the correct interpretation receives confirmation from its position in a direct line with the clearly defined impression of the last four pre-sacral vertebræ and from the presence, close to it, of the faint imprints of two transverse processes which curve backwards and are obliterated distally by the impressions of the coracoids. The limits of the four vertebræ immediately anterior to the sacrum are well defined, the three posterior also having impressions of long transverse processes. From the anterior edge of the fourth pre-sacral to the atlanto-occipital articulation is a distance approximately equal to the length of a single vertebra, and, since there is no evidence of the verbetral column having been "telescoped" in this region, it is reasonable to suppose that the original number of vertebræ anterior to the sacrum was five, or at the most six. No known Hylid normally has less than eight pre-sacral vertebræ.

The length of the scapula relative to the procaracoid has not hitherto been regarded as of fundamental importance in the definition of families, and a scapula two-thirds the length of the procoracoid is not uncommon in other recent frogs as well as in some extinct ones *, e. g., *Palæobatrachus meyeri*, Troschel †, and *P. bohemicus*, Meyer ‡. The outlines drawn in on the figure given by Noble show the right scapula as considerably longer than the left; the impressions on the matrix are equal.

Lastly, of the alleged Hylid characters, it is stated that the terminal phalanx is claw-shaped and that an intercalary phalanx or cartilage is present. Comparison has revealed exactly similar impressions of terminal phalanges in a specimen of *Discoglossus troscheli* (Meyer). Here there can be no question of intercalary phalanges, and examination of skeletons of the recent *Discoglossus pictus* discloses the true explanation of the illusion. Across the lower surface of the terminal phalanx, between a third and a half of the distance from the articular surface to the tip, is a distinct ridge, curving slightly forwards on the middle line, and rising much more abruptly proximally than distally; to the almost vertical proximal side of this ridge is attached the flexor tendon. Comparison of the three drawings in fig. 2 shows that the impression made by such a terminal phalanx is essentially similar to the impression of the fossil, whereas that made by *Hyla maxima*, where the terminal phalanx is definitely claw-shaped and there is an intercalary cartilage, is distinctly different.

The absence of an intercalary phalanx, or cartilage, in an arciferal frog is in itself sufficient to remove the species from the genus *Hyla*, as at present known, and the discovery that there are not more than six pre-sacral vertebræ, and, by inference, fusion of at least two to form the sacrum, removes one of the most valid objections to placing it in the family Palæobatrachidæ.

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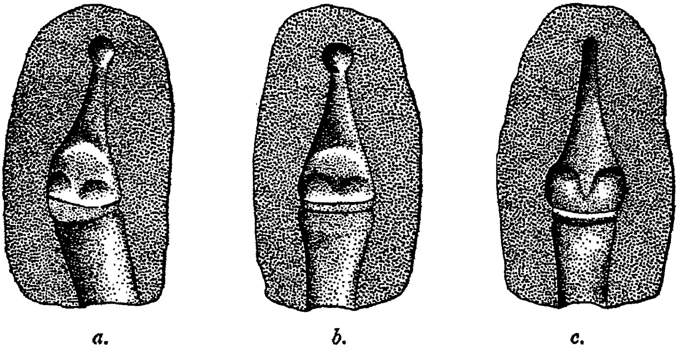
* Procter, Proc. Zool. Soc. London, 1921, pp. 197-214.

† Wolterstorff, *op. cit.* 1886, pl. viii. fig. 1 (1887).

‡ Bayer, Sitzber. Böhm. Ges. Wiss. Prag, 1880, p. 296, fig.

Other features of the fossil which, whilst not diagnostic, suggest strongly that its affininities are with the Palæobatrachidæ and Pipidæ rather than with the Hylidæ are to be found in the skull, clavicles, and pelvic girdle. It is impossible to reconstruct any of the bones of the skull with certainty, but the fragmentary remains and imprints of the pterygoid suggest that this was a large triradiate bone, much larger in proportion to the whole skull and extending much further anteriorly than in any species of *Hyla*; the impression closely resembles the pterygoid of *P. bohemicus* as figured by Bayer (*loc. cit.*) and that of *Xenopus lævis*. The clavicles, of which that of the right side is almost complete, are extraordinarily massive, strongly curved forwards, and somewhat dilated at their point of contact—characters in which they agree closely with those of *Xenopus*; those of most species of *Hyla*, though strongly anteriorly directed, are much less massive and are not dilated mesially. The pelvic girdle has undergone a certain amount of crushing and torsion, so that the imprint is not symmetrical. Nevertheless, the posterior ventral surfaces of the ilia at their point of union appear to have been laterally dilated to form

Fig. 2.

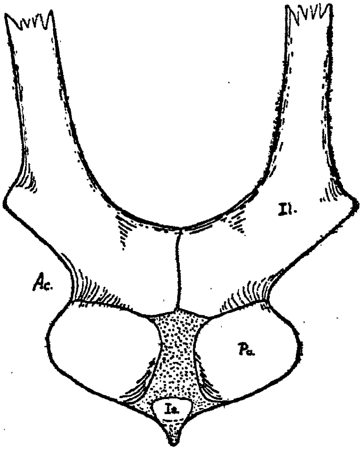


Imprints of palmar surfaces of terminal phalanges.

a, Lithobatrachus europæus (Noble); *b, Discoglossus pictus* Otth.; *c, Hyla maxima* (Laur.).

more or less rectangular plates, which have left shallow, though clearly defined, impressions. This pair of rectangular imprints is followed by another similar, but smaller, pair which are separated on the median line by a groove which projects posteriorly behind them (see fig. 1). The explanation of this series of rectangular imprints appears to be furnished by a study of the pelvis of *Xenopus lævis* (fig. 3). Here the ilia are dilated and thickened at their symphyses, the acetabula being widely separated. This dilatation is rectangular when seen from below, and is followed by a pair of laterally expanded *osseous* pubes which are separated in the middle line by a narrow strip of calcified cartilage, which is continuous with the ischia dorsally and posteriorly. The outline of the lower surface of this pelvis bears a remarkable similarity to the imprint of the fossil, and is quite unlike that of any species of *Hyla*.

Fig. 3.



Ventral view of posterior part of pelvis of *Xenopus lævis*, Daud. *Il.*, ilium; *Is.*, ischium; *Pu.*, pubis; *Ac.*, acetabulum.

In short, it may be said that this fossil frog bears greater resemblances to members of the Pipidæ and Palæobatrachidæ than to those of any other family. From the former it differs in the possession of pro- instead of opistho-cœlous vertebræ, a coccyx articulating with the sacrum by two condyles, instead of fused, and a longer and narrower scapula. The first two of these differences are regarded as of sufficient importance to be used in the definition of different families, but the chief differences from the various species of *Palæobatrachus* (shorter metacarpals, more widely dilated sacral diapophyses, complete fusion of the transverse processes of the sacral vertebræ, and the presence of a dilated bony pubis) cannot be accorded the same value; the degree of dilatation of the sacral diapophyses, the extent of their fusion, and the relative lengths of the metacarpals and radio-ulna are variable within the genus.

Since, however, the species *europea* does not fall within the limits of variation of the other species of *Palæobatrachus* with regard to these characters, and differs, moreover, from all of them, so far as is known, in the possession of a bony pubis, the erection of a new genus seems desirable.

LITHOBATRACHUS, gen. nov.

Type-species, *Lithobatrachus europæus* (Noble).

Diagnosis.—Vertebral column procœlous; 5 (or 6?) presacral vertebræ all (or all except the atlas) with transverse processes, those of the three posterior long; sacral diapophyses very strongly dilated, not fenestrated; coccyx articulating by two condyles. Skull longer than the vertebral column; teeth on the maxilla; no vomerine teeth (?); pterygoids large, triradiate, reaching the anterior half of the upper jaw. Shoulder-girdle arciferal, with massive, forwardly directed clavicles which are dilated mesially; coracoids moderately strong; scapulæ longer than broad, about two-thirds the length of the clavicles, with short low acromion region[*]. Ilia thickened at their symphyses and forming rectangular plates when seen from below; pubis bony, dilated laterally to form a flat plate. Tibiale and fibulare free; tibia shorter than the femur, the two together as long as the head and body. Metacarpals about three-fifths the length of the radio-ulna. Terminal phalanges simple.

Believing *L. europæus* to be a *Hyla*, Noble has hinted that, like many mammals existing in Miocene times in Europe, the Hylidæ may have once extended into the Ethiopian region. There is, however, no proof whatever that the Hylidæ ever existed in Europe at this time, and a study of the present geographical distribution of the Polypedatidæ suggests that the Hylids have never penetrated into tropical Africa. The Hylidæ and the Polypedatidæ are analogous forms, adapted primitively to the same type of environment, and it is significant that their geographical ranges almost dovetail into one another.

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[*] From the impression it is not possible to say whether or not the *pars acromialis* and *pars glenoidalis* are distinct.

The Polypedatidæ occur throughout Africa south of the Sahara and through India and Ceylon, Burma and Siam, northwards into China and Japan, and southwards to Celebes and Timor ; the greatest profusion of genera and species is found in the Ethiopian region. The Hylids, on the other hand, inhabit America, Asia, Europe, Africa north of the Sahara, and the Papuan region and Australia, with two centres of maximum abundance, tropical America and New Guinea. On the Asiatic mainland, the southern limit of this family is approximately a line from the Himalayas to central Annam, and in the Archipelago the genus *Hyla* extends northwards and westwards to Halmaheira and Sumba. Thus, excluding the doubtful *Hyla javana* from Java, the ranges of the two families overlap only in N.E. Burma, Tonkin, China, and Japan and on a few of the East Indian islands between Sumba, Timor, and, doubtfully, Ternate. The simplest explanation of this discontinuous Hylid distribution seems to be that the Hylidæ are of northern, possibly N. American, origin and spread westwards into Europe, southwards into the neotropical region, and, *via* the East Indian islands or land-bridge, into Papua and Australia; the Polypedatids are of African origin, but spread north-eastwards (possibly *via* the Seychelles land-bridge) into India and Farther India; where the two families came into conflict, the one better adapted became the dominant tree-frog and the other ultimately became extinct.

The other specimen, like the type of *Lithobatrachus europæus*, is an impression on a lignite slab from the Miocene beds of Rott; it is numbered R. 4841 in the Geological Department of the British Museum, and is the type of a new species for which a new genus is proposed :—

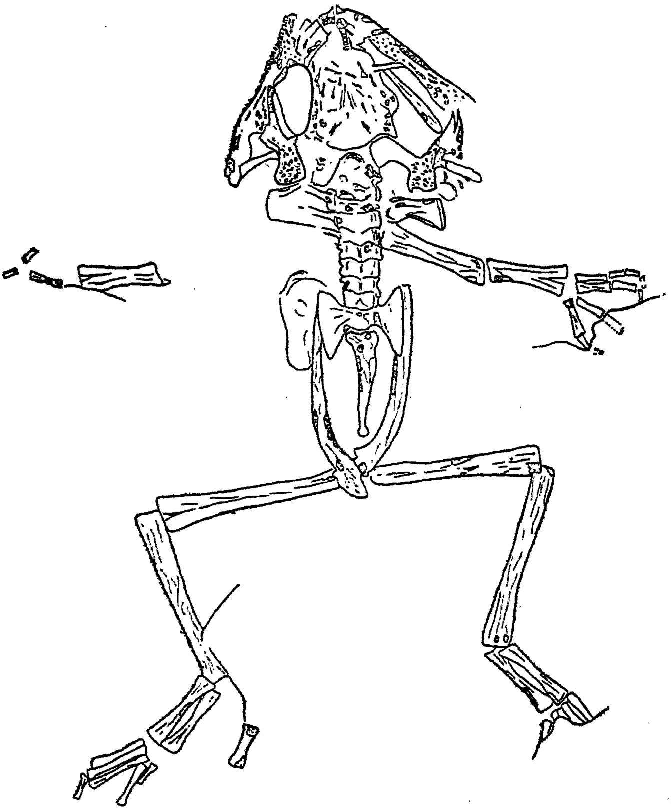
EOPELOBATES, gen. nov.

Maxillary teeth present; bony incrustations on the fronto-parietal, squamosal, and maxilla ; last two bones broadly in contact behind the orbit. Eight pre-sacral vertebræ, the anterior, at least, with short transverse processes; sacral diapophyses very widely dilated ; coccyx without transverse processes, not fused with the sacrum ; ilia not thickened at their symphysis. Scapula twice as long as broad. Tibiale and fibulare free; no pre-hallux or pre-pollex ; tibia as long as the femur, the two together much shorter than the head and body. Metacarpals less than half the length of the radio-ulna. Terminal phalanges simple.

Eopelobates anthracinus, sp. n. (Fig. 4.)

The type-specimen is the impression, shallow, but for the most part clearly defined, of the dorsal surface of the skeleton, with, here and there, adhering fragments of bone.

Fig. 4.



Eopelobates anthracinus, gen. et sp. n. Type-specimen.

Skull with a pitted secondary incrustation of bone, at least on the fronto-parietals, squamosals, and maxillæ. Premaxillæ not clearly defined, displaced, but showing the imprints of definite teeth. Nasals not defined. Fronto-parietal apparently single, with a slightly pitted bony incrustation. Maxillæ with bony incrustation, toothed; that of the left side displaced and not visible posteriorly. Squamosal large, Y-shaped, its upper portion and zygomatic process with pitted incrustation; latter process forming a broad suture with the maxilla; descending process to the quadrate sharply marked off and not encrusted. Pro-otic of left side only partially visible, apparently not encrusted. Crossing the left orbit is the imprint of another bone, possibly the mandible; if so, this bone lacks teeth. Vertebral column apparently consisting of eight presacrals, one sacral with widely dilated sacral diapophyses, and a coccyx, without transverse processes, free from the sacrum. The outlines of the four vertebræ immediately anterior to the sacrum are clearly defined, those of the others not so well; imprints of transverse processes are present on the right sides of the second, third, and fourth vertebræ. Coracoids, clavicles, and supra-scapulæ are not visible. The left scapula has, however, made a clear impression which is twice as long as broad and with a deeper imprint proximally caused by the *pars glenoidalis*. Humerus, radio-ulna, four metacarpals, and some phalanges of the left side are shown, but only the radio-ulna, one metacarpal, and two phalanges of the right. The radio-ulna, which, probably through crushing, appears divided distally, measures approximately two-thirds the length of the humerus; the third metacarpal is less than half the length of the radio-ulna, and the basal phalanx of the third finger slightly less than one-third of this distance; the terminal phalanx of the fourth toe is indefinite, but appears to have been of the knobbed type usually spoken of as simple. The pelvis is long, of normal appearance, and without any distinctive features. Femur, tibio-fibula, tibiale, and fibulare are present on both sides; the first two are subequal and together measure considerably less than the total length of the head and body; the calcaneum and astragalus are free, each measuring rather less than half the length of the tibio-fibula. Five complete metatarsals and one basal phalanx (fourth toe) are present on the right foot, but on the left foot only the proximal portions of the metatarsals are present; the first metatarsal is very short, the second longer, but shorter than the fifth, and the third and fourth subequal, measuring about four-fifths the length of the fibulare.

In the lignite matrix are numerous other fossil remains too badly crushed to be indentifiable; most of these are only visible on the reverse side of the slab, but some are present on the obverse close to the right side of the pelvis and near the right foot.

Head and body-length (from end of skull to posterior end of pelvis) 32 mm.; scapula 4·5 mm.; humerus 8 mm.; radio-ulna 5·5 mm.; sacral diapophyses (antero-posterior length) 4·5 mm.; coccyx 7 mm.; femur 12·5 mm.; calcaneum 6 mm.

The exact systematic position of this frog must necessarily remain a matter of conjecture, since many of the more important characters, such as the nature of the shoulder-girdle and the type of vertebræ, cannot be discovered. As, however, no firmisternal frogs with widely dilated sacral diapophyses are known as fossils, and since, moreover, but few recent toothed firmisternia have them so widely dilated as the present specimen, it seems probable that this was an arciferal form. In this series the presence of eight pre-sacral vertebræ precludes the Palæobatrachidæ and the long scapula and absence of transverse processes on the coccyx the Discoglossidæ.

Of the remaining arciferal families the general facies of the skeleton, and particularly the widely dilated sacral diapophyses and skull with pitted bony incrustation, suggest very strongly the Pelobatidæ; in fact, the skull, with its smooth pro-otic, encrusted dorsal, and zygomatic processes of the squamosal, but smooth and sharply defined descending process to the quadrate and complete post-orbital arch, appears to have been almost identical with that of the recent *Pelobates*. From this genus, however, it differs principally in having shorter proximal phalanges and in lacking a prehallux. Comparison with the recently described Oligocene Pelobatid, *Macropelobates**, reveals a close similarity in general proportions, but, again, the lack of a pre-hallux provides a definite distinguishing character. A pre-hallux and pre-pollex are not, however, characteristic of all Pelobatids, and the various points of similarity with the above-mentioned genera suggest that the new fossil may be a Pelobatid which lacks these organs. No other nonfossorial Pelobatid has, so far as is known, a complete postorbital arch, and for this reason, as well as on account of minor differences of relative proportions of the limbs, a new genus has been proposed.

Noble, in summarising the evolution of the Pelobatidæ †, has suggested that the first stage of their development from the primitive Discoglossidæ consisted in the ossification of the intervertebral cartilages with the production of a procœlous vertebral column, reduction of the number of pre-sacral vertebræ to eight, loss of ribs, development of an acromion, reduction of the pubis, and expansion of the sacral diapophyses; in the second stage, represented by *Macropelobates*, the pre-hallux has become enlarged, bony incrustations are ankylosed to the skull, and the sacral diapophyses greatly expanded. If this view is correct, *Eopelobates*, though slightly later in geological time than *Macropelobates*, may represent an earlier stage, for here, in addition to all the characters of the first evolutionary stage (so far as can be ascertained), are also those of the second stage with the exception of the pre-hallux.

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* Noble, 'American Museum Novitates,' cxxxii. (1924).

† *Op. cit.* p. 9.

XXVI.—*A new South African Species of* Termatophylum (*Heteroptera*, Miridæ, Termatophylinæ). By W. E. CHINA.

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IN 1912 Reuter and Poppius produced an excellent monograph of the family Termatophylidæ[*] (Öfv. Finska Vet.-Soc. Förh. liv. A, no. 1, pp. 1–17) in which four genera and nine species were dealt with. Since that time, so far as I am aware, no other species—at least from the Old World—have been described. The following new species, collected by Mr. Rowland Turner in S. Africa, has been referred to the genus *Termatophylum*, although the first antennal segment barely extends beyond the apex of the head. However, I believe this is scarcely a character of generic importance.

Termatophylum turneri, sp. n.

♂. Black, more or less sparsely covered with rather long silvery hairs, the underside of head, third segment of antenna, rostrum, prosternum between coxal cavities, apical half of scutellum, a large spot at base of membrane beyond the apex of the cuneus, and all the legs except apical two-thirds of hind femora and claws, dull yellowish white.

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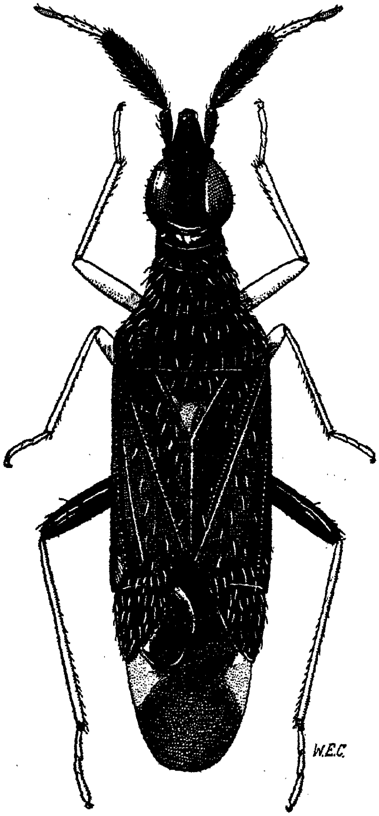
[*] For reasons given in a previous paper (Ann. & Mag. Nat. Hist. (10) iii. pp. 107 & 113, 1929) this group is now regarded merely as a subfamily of the Miridæ.

♂. Head shining black, slightly transversely rugose, with a few scattered pale hairs ; about two-thirds as broad (across



Termatophylum turneri, sp. n.

eyes) as long (29 : 40) and extending three-eighths its length beyond apex of eyes (15 : 40) ; eyes moderately prominent, with a few outstanding very short hairs, equal in diameter to width of vertex between eyes ; posterior margin of vertex with a distinct, rather broad, rugosely rounded, posteriorly curved carina or ridge; rostrum slender, extending to apex of anterior coxæ, first segment very short, relative length of segments 5, 25, 20, 10; first antennal segment black, moderately incrassate, narrowed at base, scarcely extending beyond the apex of head, second segment strongly incrassate, more or less fusiform, shining black, covered with moderately long dark bristle-like hairs, third and fourth segments pale yellow, slender, more or less linear, covered with short pale hairs, the fourth segment somewhat flattened and infuscate; relative length of segments 11, 30, 13, 11; "neck" intensely shining, with a whitish spot in middle of dorsal side. Pronotum rather dull black, humeral lobes more or less shining, about four-fifths as long as broad (39 : 50); lateral margins strongly concave, more or less carinate between the lobes; anterior collar comparatively long, nearly one-third as long as broad (7 : 23); anterior lobe rather flat, the calli not well defined, more than twice as broad as long (30 : 13), lateral margins slightly convex; posterior lobe rather flat, sides strongly convergent anteriorly, humeral angles strongly rounded, posterior margin broadly but shallowly convex; sparsely covered with long silvery hairs, the pilosity more dense laterally. Scutellum triangular, equilateral, about half the length of the pronotum, rather flat, the surface transversely obscurely rugose, with a few scattered long pale hairs; black, with apical half sordid white. Hemi-elytra well developed, extending well beyond the apex of abdomen, black, rather feebly shining, with scattered silvery pubescence of short and long hairs; claval commissure equal in length to lateral margin of scutellum, claval suture ("clavalader" of Reuter and Poppius), and embolial suture distinctly but finely punctate, *R+M** ("cubitalader" of Reuter and Poppius) well marked and running closely beside the embolial suture, *Cu* 1 ("claval suture" of Reuter and Poppius) running closely beside the punctate claval suture; cuneus one-third the length of corium; membrane shining black at base, shading to dark fuscous apically, the basal half of the basal cell vein, a large spot beneath apex of cuneus, and a small spot on the opposite side of the membrane (only visible when hemi-elytra are separated) sordid white. Legs pale whitish yellow, the hind femur except basal fourth intensely shining black; simple, moderately slender, unarmed except for a few

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* For explanation of venation in *Termatophylum*, see Ann. & Mag. Nat. Hist. (10) iii. p. 113 (1929). Reuter and Poppius have mistaken the claval suture for a claval vein.

pale brown hairs and fine bristles; tarsi three-segmented, the middle segment shortest; claws brown. Abdomen intensely shining black, each ventral segment with one or two transverse rows of moderately short, regularly spaced, pale hairs, and with several very long bristle-like hairs placed laterally on the seventh and eighth ventrites. Pygophor strongly twisted to the left, the left-hand paramere very long, dilated, and apically acute (lanceolate), the whole organ distinctly curved; right-hand paramere not visible (without dissection).

Total length 2·9 mm; width across humeral angles 0·8 mm.

2 ♂♂, S. Africa, Cape Province, Matjesfontein, 7–13. xi. 1928, and 1–18. xii. 1928 (*R. E. Turner*).

In the key published by Reuter and Poppius (*loc. cit.* p. 7) this species runs down to *insigne*, Reuter, from which it is at once distinguished by its more slender build, its black colour, and white legs (except black hind femora). In the black coloration *T. turneri* resembles *T. nigrum*, Popp., from which it differs by the shorter rostrum, white apical half of scutellum, the uniformly white tibiæ, and by the white spots on the membrane.

XXVII.—*Three new Grasshoppers of the Genus* Caprorhinus, *Saussure, from Madagascar* (*Orthoptera*, Acrididæ). By B. P. UVAROV.

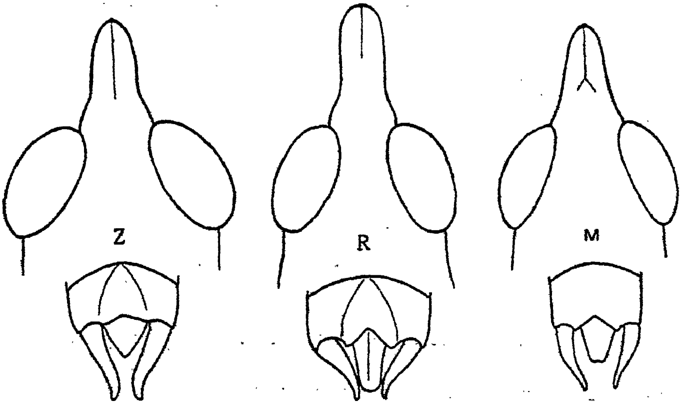
THE genus *Caprorhinus* has been described by Saussure to include a single species—*Caprorhinus fusiformis*, Sauss. (Abhandl. Senkenberg. naturfor. Ges. xxi. Heft 4, 1899, p. 642)—from an unspecified locality in Madagascar. L. Bruner published a very brief and unsatisfactory description of another species—*C. squamipennis*—from Anjoun, Comoro Islands (Voeltzkov, 'Reise in Ostafrika in den Jahren 1903–1905,' Bd. ii. 1910, p. 628, pl. xxvii. fig. 7).

A collection of Acrididæ made in Madagascar by my friend Mr. B. N. Zolotarevsky contained fifteen specimens belonging to the genus *Caprorhinus*, all taken in the southern part of the island. The bulk of the specimens are females, and there are only three males, which all proved to belong to distinct species. None of the three species can be identified with *Caprorhinus fusiformis*, Sauss., while there is scarcely any chance that the unrecognizable *C. squamipennis*, L. Br., of the Comoro Islands, occurs in Madagascar as well, and I decided, therefore, to describe these three species as new.

The types are deposited in the British Museum (Natural History).

Caprorhinus zolotarevskyi, sp. n. (Fig. Z.)

♂ (*type*). Fastigium of vertex shorter than an eye, parabolic at the apex and distinctly widened basally. Frontal ridge with the sulcus rather suddenly narrowed near the apex. Eyes large, strongly projecting sideways. Anterior margin of the pronotum very shallowly and broadly excised in the middle; posterior margin with a distinct obtusangulate excision, the margins of which are convex. Posterior lower angle of lateral pronotal lobes slightly obtuse, rounded. Prosternum with a small conical tubercle. Mesosternal interspace anteriorly as broad as the greatest width of a mesosternal lobe, posteriorly slightly narrowed.



Z. *Caprorhinus zolotarevskyi*, sp. n., ♂: head and the end of abdomen from above.
R. *C. rostratus*, sp. n., ♂: ditto.
M. *C. minor*, sp. n., ♂: ditto.

Last tergite rather large, distinctly transverse, with a faint parabolic sulcus; hind margin very shallowly and obtusely excised in the middle, and shallowly and roundly excised at the base of the cerci. Supraanal plate short, triangular. Cerci about twice as long as the supra-anal plate, slightly incurved and distinctly decurved. Subgenital plate in profile almost quadrate, with the hind margin concave.

General coloration olive-brown. Lower part of the face, oblique postocular fasciæ, lower half of lateral pronotal lobes, pleuræ, and hind femora are green. Elytra brick-red, with the costal part black. Hind knees black all round. Hind tibiæ steel-blue, purplish above and near the base; spines yellowish, black-tipped.

♀ (*paratype*). Fastigium of vertex distinctly shorter than an eye, narrowly parabolic apically and strongly widened basally. Coloration uniformly olive-green (olive-brown in some specimens). Hind knees only with a semilunar blackish spot on each side.

Total length, ♂ 29, ♀ 33; pronotum, ♂ 4·5, ♀ 5; hind femur, ♂ 14·5, ♀ 14 mm.

Described from one male and ten females, taken on the way from Bazaka to Tongolory, Tulear, S. Madagascar, 4. i. 1928.

Relatively short fastigium of vertex, short triangular supra-anal plate of the male, and very prominent eyes make this species very distinct from others, and I have much pleasure in dedicating it to my friend B. N. Zolotarevsky, Government Entomologist in Madagascar.

Caprorhinus rostratus, sp. n. (Fig. R.)

♂ (*type*). Slightly smaller and more slender than the preceding species.

Fastigium of vertex considerably longer than an eye; its apex elliptical; sides parallel; the base somewhat widened. Frontal ridge with the sulcus gradually narrowed above. Eyes of moderate size. Anterior margin of the pronotum broadly convex, scarcely notched in the middle; posterior margin obtusely excised, the margins of the excision convex. Posterior lower angle of lateral pronotal lobes subacute, rounded. Prosternum with a low conical tubercle. Mesosternal interspace anteriorly as broad as the greatest width of a lobe, posteriorly strongly narrowed.

Last tergite large, transverse, with a faint parabolic sulcus; its hind margin with a fairly deep obtusangular excision in the middle and rounded-excised on the sides. Supra-anal plate liguliform, slightly narrowed towards the rounded-truncate apex; the surface with a shallow median sulcus. Cerci a little longer than the supra-anal plate, feebly incurved and decidedly decurved near the apex. Subgenital plate large, its hind margin in profile very slightly concave.

General coloration pale olive-brown; the same parts as in *C. zolotarevskyi* are pale green. Elytra brick-red, with the costal part black. Hind knees with only semilunar spots black. Hind tibiæ as in *C. zolotarevskyi*, but paler.

Total length 28; pronotum 4; hind femur 14 mm.

A single male from Vohimarina, Tongolory, Tulear, S. Madagascar, 2. i. 1928.

Appears to be similar to *C. fusiformis*, Sauss., but in the latter species the pronotum is said to be only minutely sinuate behind, while the last tergite is described as very obtusely subincised.

Caprorhinus minor, sp. n. (Fig. M.)

♂ (*type*). Smaller than the two preceding species.

Fastigium of vertex about as long as an eye, parabolic, gradually and considerably widened basally. Frontal ridge with the sulcus gradually narrowed above. Eyes of moderate size. Anterior margin of the pronotum broadly convex, not notched in the middle; posterior margin scarcely excised. Posterior lower angle of the lateral lobes slightly less than right, rounded. Prosternum with a fairly large conical tubercle. Mesosternal interspace anteriorly a little narrower than one of the lobes, posteriorly somewhat narrowed.

Last tergite almost quadrate; hind margin with a deep obtusangular excision in the middle, and shallowly roundly excised on the sides. Supra-anal plate elongate, trapezoidal, with the apex shallowly emarginate. Cerci considerably longer than the plate, incurved and decurved. Subgenital plate with the hind margin feebly concave in profile.

Coloration as in *C. rostratus*.

Total length 24; pronotum 3·5; hind femur 12·5 mm.

A single male from Vohimarina, Tongolory, Tulear, S. Madagascar, 2. i. 1928.

This species is considerably smaller than *C. fusiformis*, Sauss., and the two new species described above, and differs from them all by the shape of the last tergite and of the supra-anal plate. The inadequately described *C. squamipennis*, L. Bruner, is still smaller, and is known not from Madagascar, but from the Comoro Islands.

incurved and distinctly decurved. Subgenital plate in profile almost quadrate, with the hind margin concave.

General coloration olive-brown. Lower part of the face, oblique postocular fasciæ, lower half of lateral pronotal lobes, pleuræ, and hind femora are green. Elytra brick-red, with the costal part black. Hind knees black all round. Hind tibiæ steel-blue, purplish above and near the base; spines yellowish, black-tipped.

♀ (*paratype*). Fastigium of vertex distinctly shorter than an eye, narrowly parabolic apically and strongly widened basally. Coloration uniformly olive-green (olive-brown in some specimens). Hind knees only with a semilunar blackish spot on each side.

Total length, ♂ 29, ♀ 33; pronotum, ♂ 4·5, ♀ 5; hind femur, ♂ 14·5, ♀ 14 mm.

Described from one male and ten females, taken on the way from Bazaka to Tongolory, Tulear, S. Madagascar, 4. i. 1928.

Relatively short fastigium of vertex, short triangular supra-anal plate of the male, and very prominent eyes make this species very distinct from others, and I have much pleasure in dedicating it to my friend B. N. Zolotarevsky, Government Entomologist in Madagascar.

Caprorhinus rostratus, sp. n. (Fig. R.)

♂ (*type*). Slightly smaller and more slender than the preceding species.

Fastigium of vertex considerably longer than an eye; its apex elliptical; sides parallel; the base somewhat widened. Frontal ridge with the sulcus gradually narrowed above. Eyes of moderate size. Anterior margin of the pronotum broadly convex, scarcely notched in the middle; posterior margin obtusely excised, the margins of the excision convex. Posterior lower angle of lateral pronotal lobes subacute, rounded. Prosternum with a low conical tubercle. Mesosternal interspace anteriorly as broad as the greatest width of a lobe, posteriorly strongly narrowed.

Last tergite large, transverse, with a faint parabolic sulcus; its hind margin with a fairly deep obtusangular excision in the middle and rounded-excised on the sides. Supra-anal plate liguliform, slightly narrowed towards the rounded-truncate apex; the surface with a shallow median sulcus. Cerci a little longer than the supra-anal plate, feebly incurved and decidedly decurved near the apex. Subgenital plate large, its hind margin in profile very slightly concave.

General coloration pale olive-brown; the same parts as in *C. zolotarevskyi* are pale green. Elytra brick-red, with the costal part black. Hind knees with only semilunar spots black. Hind tibiæ as in *C. zolotarevskyi*, but paler.

Total length 28; pronotum 4; hind femur 14 mm.

A single male from Vohimarina, Tongolory, Tulear, S. Madagascar, 2. i. 1928.

Appears to be similar to *C. fusiformis*, Sauss., but in the latter species the pronotum is said to be only minutely sinuate behind, while the last tergite is described as very obtusely subincised.

Caprorhinus minor, sp. n. (Fig. M.)

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Fastigium of vertex about as long as an eye, parabolic, gradually and considerably widened basally. Frontal ridge with the sulcus gradually narrowed above. Eyes of moderate size. Anterior margin of the pronotum broadly convex, not notched in the middle; posterior margin scarcely excised. Posterior lower angle of the lateral lobes slightly less than right, rounded. Prosternum with a fairly large conical tubercle. Mesosternal interspace anteriorly a little narrower than one of the lobes, posteriorly somewhat narrowed.

Last tergite almost quadrate; hind margin with a deep obtusangular excision in the middle, and shallowly roundly excised on the sides. Supra-anal plate elongate, trapezoidal, with the apex shallowly emarginate. Cerci considerably longer than the plate, incurved and decurved. Subgenital plate with the hind margin feebly concave in profile.

Coloration as in *C. rostratus*.

Total length 24; pronotum 3·5; hind femur 12·5 mm.

A single male from Vohimarina, Tongolory, Tulear, S. Madagascar, 2. i. 1928.

This species is considerably smaller than *C. fusiformis*, Sauss., and the two new species described above, and differs from them all by the shape of the last tergite and of the supra-anal plate. The inadequately described *C. squamipennis*, L. Bruner, is still smaller, and is known not from Madagascar, but from the Comoro Islands.

XXVIII.—*The supposed Phyllocarid Genus* Hibbertia.
By THOMAS H. WITHERS, F.G.S.

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HAVING had occasion recently to examine a number of fragmentary fossil Arthropods, I compared them with the fossil described by Jones and H. Woodward as *Hibbertia orbicularis*, gen. et sp. n., from the Lower Carboniferous of Burdiehouse, near Edinburgh (Dec. 1898, Palæontogr. Soc. Monogr. Palæoz. Phyllopoda, pt. iii. pl. xxv. figs. 8*a*, *b*; Sept. 1899, Geol. Mag. (dec. iv.) vi. p. 390, pl. xv. fig. 4; Dec. 1899, Palæontogr. Soc. Monogr. Palæoz. Phyllopoda, pt. iv. p. 205). This specimen is in the Geological Department of the British Museum. It is registered I. 4010, and was presented by the late Dr. John Millar, F.G.S. It was said by Jones and Woodward to bear the label "Coal M.[easures], Burdiehouse," but the only labels now with the specimen are written by Jones and Woodward. The fossil was considered by those authors to represent a Phyllopod Crustacean, and to be "more conveniently placed along with and near to those forms referred to the genus *Cyclus* than with any other group."

Curiously enough, Jones and Woodward said (1899, Geol. Mag. p. 390):—"It was at first believed to be one of Dr. Hibbert's types from Burdiehouse, but nothing like this fossil was found to have been figured or mentioned in Dr. Hibbert's memoir (1836, Trans. Roy. Soc. Edinburgh, xiii. pp. 169–296, pls. v.–xii.) on the strata and fossils of Burdiehouse." This is not surprising, for an examination of the specimen leaves no doubt at all that it is the horseshoe-like brim of the head of the Trilobite *Harpes* seen from beneath. It belongs to the species *Harpes flanagani*, Portlock, from the Upper Ordovician (Desertcreat group) of Tyrone, Ireland, and the matrix agrees in every way with specimens from that horizon and locality.

Hibbertia orbicularis is, therefore, not a Carboniferous fossil, and the genus *Hibbertia*, Jones and H. Woodward (1898), becomes a synonym of the Trilobite genus *Harpes*, Goldfuss (1839).

XXIX.—Hylochœrus grabhami, *a new Species of Fossil Pig from the White Nile.* By A. TINDELL HOPWOOD, M.Sc., F.L.S.

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IN September 1928 Mr. G. W. Grabham, Geologist to the Sudan Government, left a small collection of fossils for examination in the Geological Department of the British Museum. Among the specimens were two mammalian teeth. One (registered M 13254 B.M. G. D.) could only be identified as the lower canine of some carnivore; the other was the third molar of a pig, allied to the forest-hog of Central Africa, and may be described as

Hylochœrus grabhami, sp. n.

Diagnosis.—A *Hylochœrus* resembling *H. euilus*, Hopwood, but with narrower teeth, and with the folding of the enamel less complicated than in that species; two columns between each pair of cusps.

Holotype.—A right third lower molar, broken anteriorly; reg. no. M 13253 Brit. Mus. Geol. Dept.

Horizon.—"45 ft. depth in a well. . . . These are from alluvial deposits in close proximity to the White Nile. The type of mineralisation appears similar to the fossil bones found in the bed of the Blue Nile at Khartum, from among which the late Dr. Andrews described part of the molar of an elephant" (*Grabham*, in litt.).

Locality.—Well "in the District Commissioner's garden at Kosti, on the White Nile, about 180 miles S. of Khartum, Lat. 13° 9½′, Long. 32° 40½′."

Dimensions.—Length of complete tooth over 60 mm.; width of grinding-surface 18·5; width at base of crown 22.

Description.—The front of the tooth has been broken away. Presumably the entire tooth should consist of three pairs of cusps with two columns in the valleys between each pair, and a large talonid. In all probability there is a strong anterior cingulum. Although there is no cement preserved in the type, yet its presence in the fresh tooth may be inferred, since it occurs in the teeth of other species.

The cusps of the first pair are broken; those of the second pair are practically entire. They have the enamel folded so as to present a three- or four-lobed cross-section. In each of the valleys between them and the first and third pairs of cusps are two columns, situate in the middle line of the tooth in pairs. The columns in the first valley are too broken for description; those in the second valley, between the second and third pairs of cusps, are trilobate. An important point is that the columns before and behind the second pair of cusps are so closely approximated that the cusps themselves are forced apart. This is carried a stage further in the third pair of cusps, for there a small column in the centre gives a quincuncial arrangement. The talonid is made up of some eleven columns. These show a tendency to become grouped, with a main pair and two accessory columns in each group.

Remarks.—*H. grabhami* occupies a place almost exactly halfway between the fossil species *H. euilus*, Hopwood, and the genotype *H. meinerzhageni*, Thomas, a recent species. It agrees with the former in the lobation of the enamel, although it has not this feature to such a marked degree. On the other hand, it agrees with the recent species in having two accessory columns between the pairs of cusps, instead of one as in *H. euilus*. It differs from both in the extent to which the accessory columns tend to force the components of any one pair of cusps apart.

The trivial name is given in honour of Mr. Grabham, to whom the Department of Geology is indebted for the gift of both the specimens mentioned in this note.

XXX.—*An interesting Collection of Mammals, with a remarkable new Species of Hare from Uganda.* By Miss JANE ST. LEGER.

THE British Museum has recently received an interesting collection of specimens from Capt. C. R. S. Pitman, to whom, ever since his arrival in Uganda in 1925, we are indebted for a large number of specimens of East African mammals and birds. Included in this last collection is a remarkable hare from Bunyoro and three skins and skulls of the red Colobus —*Colobus tephrosceles*,—which has never been obtained since Sir Harry Johnston's discovery of it on the Ruahara River in 1901.

Cercopithecus pygerythrus centralis, Neum.

♂. 496. Busesse, N.W. Ankole.
♀. 490. Entebbe.
"Common, widely distributed."

Cercopithecus leucampyx doggetti, Pocock.

♀ (old). 503. Katera, Manzira Forest, Masaka, 3800′.

"A small troop with a large troop of Colobus. The only one at which we could get a shot. The others all disappeared, probably hid."

This specimen from a locality comparatively near the typical locality, which is given as "S.W. Ankole," is especially interesting, as the type-skull is young, with m^3 not yet in position, and the only other specimens in the Museum are a series of flat skins without skulls from the Congo Forest, between Lualaba and Masisi, and two skins with skulls from N. and S.E. Lake Kivu respectively.

Colobus cottoni, Lyd.

♀. 491. Toro Forest, S.E. Masaka.

♂. 501, 502; ♀. 500, 504, 505, 506.

"Common in the forest in large troops. The old males are difficult to obtain, as they evidently take to flight at the first alarm. Youngsters are plentiful. Found in low-lying forest liable to inundation adjacent to the shores of Victoria Nyanza."

This is an interesting series, extending as it does considerably the range of the above species, of which the type-locality is Ituri Forest, E. Congo. It is comparatively rare, as Pitman writes:—"The Baganda call this species 'Munyunlo,' as distinct from the ordinary Colobus, which they call 'Ngeye.'"

Colobus p. uellensis, Matsch.

? 499. Busesse.

A flat skin, without skull.

Colobus tephrosceles, Elliot.

♂. 493; ♀. 494, 495 (juv.). Mpanga River, E. of Lake George, on the Toro border, Busesse.

This species has never been obtained since Sir Harry Johnston discovered it in 1901 on the Ruahara River, Toro, and sent four specimens to the British Museum, where it was referred to the species *C. rufomitratus* (Thos., P. Z. S. 1901). Of the above series from the Toro Forest, on the Mpanga River, Capt. Pitman writes that ever since his arrival in the Protectorate early in 1925 he had heard native reports of a vicious red monkey occurring in the N.W. corner of

Ankole, which the natives stated frequently descended the trees and attacked them. He had never come across any European who had seen it, and, feeling convinced it was a species of red Colobus, he determined to obtain it at the first opportunity; and in September last Capt. R. Salmon, one of the Game Rangers, succeeded in collecting the present series. He found the monkey fairly common in the forest and in the huge acacias which border the Mpanga River. They were very fearless and inquisitive, and took great interest in his dog, coming low down in the trees to hoot at it.

Lepus marjorita, sp. n.

♂. 510, 511; ♀. 509, 512. Near Masindi, Bunyoro, Uganda, 4000′.

"Common on the roads at night."

At first glance this extraordinary hare might easily be mistaken for a species of *Pronolagus*, whilst in some characters it strongly resembles the Indian *Caprolagus*. A closer examination, however, proves it to be a true *Lepus*, although differing in many characters—external, cranial, and dental—from any form hitherto described from either the Old or New Worlds.

Fur decidedly crisp, not as stiff as that of *Caprolagus*, but crisper than that of any African hare, being most nearly approached in this respect by *L. whytei*, from Nyasa.

General colour of head and back a dark grizzle of black and yellow, the black tending to become less pronounced laterally. Individual hairs 30–35 mm. in length, the first 5 mm. being greyish white merging gradually into black, with a subterminal yellow ring 5 mm. in width, tip black. Intermixed are longer stiffer hairs, 35–40 mm. in length, which on the mid-dorsal surface are black, whilst on the sides and flanks they tend to become yellow-ringed subterminally, and the shorter hairs to lose their black tips, so merging gradually into the colouring of the ventral surface, which is buffy yellow, with an ill-defined pure white central stripe. Underfur pale grey at base, dull buffy terminally.

Ears remarkably small, recalling those of *Pronolagus crassicaudatus*, their backs dark brown with a very slight grizzle of yellow. Inner side greyish, with a faint rufous tinge at edges. Nape-patch pale rufous. Front and outer surface of arms and legs yellowish brown, long hairs of palms and soles dull rufous (possibly due to staining, as in two of the specimens the long hairs are bright rufous). Claws sharp as in true *Lepus*, not blunted as in *Pronolagus*. Tail short, thick, its general shape similar to that of *Pronolagus*, but much smaller. Colour a grizzle of black and yellow above, pure white beneath.

Skull: general shape as in *Lepus*, but with a totally different postorbital process, of which the anterior limb is entirely lacking as in *Pronolagus*. Posterior limb narrow and pointed, entirely different in shape from the wide triangular-shaped process of *Pronolagus*, and closely resembling that of the Indian *Caprolagus*. Nasals rather broad, as in *Lepus*, the nasal-frontal suture shallow V-shaped. The limb of the premaxillary bone lying parallel to the nasals is unusually long, and is continued for 1–3 mm. beyond the most posterior point of the nasal-frontal suture; in all other skulls of *Lepus* in the British Museum the premaxillary bones terminate posteriorly at a point subequal or distinctly anterior to the nasal-frontal suture.

Palate comparatively rather long and choanæ narrow, as in *Lepus whytei* from Nyasa. Horizontal palate-bones forming about one-third of palatal bridge. Incisive foramina wide, triangular. Posterior palatal foramina normal in size and situated either in the normal position at the anterior outer angle of the junction of the palatine plate of them axilla with the horizontal plate of the palate-bone, or slightly behind this junction. Bullæ medium. First upper incisors flat, each with a deep simple groove, not filled with cement. Upper cheek-teeth as in *Lepus*. Mandible and lower incisors normal. First lower cheek-tooth divided, as in *Lepus*, into two portions by a deep re-entrant angle extending across from the external face. Anterior portion of this tooth differing from the normal in that it shows a small re-entrant angle on its internal surface. The external surface has the usual rather broader re-entrant angle, whilst the anterior surface may have one small re-entrant angle, as usual in *Lepus*, or the place of this angle may be taken by two much smaller angles. Both these conditions may obtain in the same skull, and, in fact, do so in the type, of which the right lower cheek-tooth shows two small anterior angles, whilst on the left side of the jaw there is one small re-entrant angle on the anterior face of the first cheek-tooth. Other teeth as in *Lepus*.

Measurements of skin no. 509 (paratype):—

Head and body 495 mm.; tail 45; hind foot 90; ear 65. Weight 6 lb.

Skull-measurements of type (B.M. no. 29. 5. 14. 30):—

Skull: greatest length 85; condylo-incisive length 70; zygomatic width 40; nasals, median length 31·5, greatest breadth 17·5; interorbital 20; length of palatal foramina

22·8; greatest combined width 9; least length of palate 7·5; width of palate 11·6; width of choanæ opposite m^3 5. Lower jaw, condylo-incisive length 63.

Hab. Near Masindi, Bunyoro, Uganda, 4000′. "Very common on grassy roads at night." Four specimens, skins and skulls.

As regards external characters this remarkable hare is distinguished by its unusually crisp fur, by its short ears, and by its tail, which is remarkable both for its small size and for its colour, the whole of the upper surface and sides being grizzled black and yellow, leaving only a comparatively narrow strip of white on the under surface, whereas in other African hares the upper surface only of the tail is black or grizzled, the colour generally being confined to a narrow stripe and the whole of the rest of the tail being pure white. The only exception is *L. monticularis* from Deelfontein, in which the tail also resembles that of *Pronolagus* but lacks any white at all, and is much larger than in *L. marjorita.*

The skull is most conspicuously differentiated by the unusual length of the premaxillaries, which are extended backwards beyond the most posterior point of the nasal-frontal suture, and by the peculiar supraorbital process, resembling that of the Indian *Caprolagus*, from which genus, however, the skull differs by its lighter build, narrower nasals, wider anterior palatal foramina, and other characters which prove it to be a true *Lepus.*

The infolding of the enamel of the anterior molariform teeth is of some interest. An examination of the lower jaws of some two hundred skulls of *Lepus* in the British Museum shows nine only which differ from the normal in this respect. Of these two specimens show the two small angles taking the place of the normal single angle on the anterior face, and seven a small angle on the normally smooth internal face of the anterior half of the tooth. The additional internal angle seems likely to prove a constant character in *L. marjorita*, as it is present in all four skulls of the above series. The normal single anterior angle is replaced by two small angles in two only of the skulls, and in each case it occurs on one side of the jaw only.

I have great pleasure in naming this hare in honour of Mrs. Marjorie Pitman, to whom, together with her husband, we are indebted for its discovery.

XXXI.—*A new Gerbil from Kordofan.*
By Miss JANE ST. LEGER.

INCLUDED in a collection of small mammal skins sent for identification by the Entomological Department at Khartoum to the British Museum occurs the following gerbil, which upon examination proves to be new. It differs entirely in colour from the usual pale sandy shade of desert animals, and its deep tawny colour is probably due to its occurring within the wide area of grassy land which invades the desert from the Sobat River in the south and from the White Nile in the east, extending as far as the south of Kordofan.

Gerbillus rosalinda, sp. n.

A small, strongly coloured gerbil from Abu Zabad, 145 km. S.W. of El Obeid, S. Kordofan. Size rather larger than *Gerbillus agag* from Agageh Wells, W. Kordofan, and colour totally different, being deep tawny instead of the usual sandy buff colour of both its near neighbours, *G. agag* and *G. pygargus*. The general tawny colour deepens slightly on the mid-dorsal line, where the base of the hair is bluish grey, whilst laterally the base of the hair is white. Underparts pure white, the line of demarcation everywhere distinct. Head the same colour as the body; white of cheeks unusually restricted, the colour of the back extending forwards and forming a narrow tawny line beneath the eye. A slight black pencil-line down centre of nose. Supraorbital and post-auricular white patches scarcely marked. Whole of fore limb white, hind limb with a tawny line down the outer side, elsewhere white. Hands and feet pure white, the palms and soles thickly haired. Tail tawny above, slightly annulated dark brown, buffy beneath. Hairs of pencil-end dark brown above, white below.

Skull more heavily built than in *G. agag*, but smaller and lighter than in *G. pygargus*. Brain-case comparatively narrow. Teeth as in *G. agag*.

Type. Adult male. B.M. no. 29. 5. 19. 12.

Measurements (from dried skin):—

Head and body 97·5 mm.; tail 115; ear 11·7; hind foot (s. u.) 24.

Skull: greatest length 30·5; condylo-incisive length 24·6; nasals 11·2; breadth of brain-case 13·6; anterior palatine foramina 5; posterior palatal foramina 2; bulla, greatest length 11·2.

Seven specimens examined. Unfortunately, no measurements were taken when captured, and further material may prove that the head and body measurements and those of the tail should be greater than those given above, which are taken from the dried skin.

XXXII.—*Descriptions and Records of Bees.*—CXIX.

By T. D. A. Cockerell, University of Colorado.

Sphecodes levequæ, sp. n.

♀.—Length about 10 mm., anterior wing 8 mm.

Robust, head and thorax black, legs entirely black, abdomen very bright chestnut-red, shining, with the apical margin and sides of fifth tergite and the apex black, the apex also with a thick tuft of dark sooty hair; head transverse, face very broad; eyes purplish black; mandibles black, apically obscure reddish, with a strong inner tooth; clypeus coarsely and rather closely punctured, but with the shining surface visible, an evident median sulcus; front closely and coarsely punctured; antennæ dark, the flagellum obscurely brownish beneath; third and fourth joints equal, fifth about a fourth longer; tubercles prominent, subacute; mesothorax highly polished, with scattered strong punctures, median groove distinct; scutellum polished, the disc on each side of middle practically impunctate; area of metathorax large, broad triangular, coarse reticulate; tegulæ dark rufous. Wings very strongly reddened, stigma very dark rufo-fuscous, nervures fuscous; second cubital cell narrow, receiving first recurrent nervure near end; third cubital cell long, the part beyond the second recurrent equal to the lower side of second cubital before the first recurrent. Legs with thin pale hair, spurs red. First abdominal segment blackened at extreme base, but with no discal spot, its surface nearly impunctate, but with very widely scattered minute weak punctures; second tergite with very fine rather close punctures on the basal two-fifths; no deep constriction at base of second tergite; venter distinctly punctured.

Boulder, Colorado, 1925 (*Norma Le Veque*).

Related to *S. arvensiformis*, Ckll., from the north-west, but readily separated by the black apex of abdomen, less densely punctured clypeus, triangular area of metathorax, and longer third cubital cell. Also related to the smaller *S. obscurans*, Lov. & Ckll., from the north-east.

Nomada semirugosa, sp. n.

♀.—Length about 8·6 mm.

Head, thorax, legs, and antennæ ferruginous, the antennæ entirely red, with the third joint about as long as fourth on upper side, but shorter on under; mandibles simple, black at end; eyes pale grey; facial quadrangle longer than broad, the face with thin appressed white hair; clypeus dullish, with dense shallow punctures; no black in region of antennæ, but a little about ocelli; mesothorax and the strongly bigibbous scutellum dull, densely punctured; mesothorax with a median black stripe and a broad black stripe down metathorax; postscutellum all red; sides of metathorax with much white hair; pleura with white hair; tubercles prominent, shining; tegulæ ferruginous, punctured. Wings brownish, with the usual subapical hyaline spots; basal nervure going some distance basad of nervulus; second cubital cell broad below, narrowed above, receiving recurrent nervure a little beyond middle; third cubital cell short. Hind femora with a blackish stain beneath. Abdomen light red, shining, extremely finely punctured; first tergite without yellow, but with an arcuate band at base; second with lateral, widely separated, bright yellow pyriform marks; third with small subdorsal marks; fourth with a yellow band, narrowly interrupted in middle, swollen laterally, but not extending to sides, and no lateral spots; fifth with a transverse yellow patch; sides of tergites 2 to 4 with thin white hair; apical silvery band distinct; venter red without yellow marks.

Boulder, Colorado, 1925 (*Norma Le Veque*).

Very much like a small *N. coloradensis*, Ckll., but distinguished by the dull rough mesothorax, white hair at sides of metathorax, lack of yellow spots at sides of fourth tergite, etc. The yellow band on fifth tergite is entirely dull, not shining as in *N. cressonii*, Rob. The cheeks are black posteriorly, but with a rather broad red band behind the eyes.

Miss Le Veque also took *N. vicinalis*, Cresson, male, at Boulder.

Colletes cauponarius, sp. n.

♀.—Length nearly 8 mm., anterior wing 6·5 mm.

Black, robust, mandibles dark rufous except at base; antennæ short, the flagellum very obscurely reddish beneath, fourth joint short, no longer than third; malar space fully twice as broad as long; labrum shining, obtusely angulate, with a small subbasal pit; clypeus convex, with a median sulcus, shining, coarsely striate-punctate; hair of head and thorax abundant, moderately long, on front, occiput, and thoracic dorsum fulvous, on cheeks and sides of thorax white; prothoracic spines sharp, but almost concealed by hair; mesothorax coarsely and rather closely punctured anteriorly and at sides, but posterior disc brilliantly shining, with very few punctures; area of metathorax with a transverse keel, the space above it with the usual cross-ridges; tegulæ dark rufous. Wings hyaline, faintly brownish; stigma dark dusky red, hardly produced into marginal cell; nervures dark; second cubital cell very broad, receiving recurrent nervure a little beyond middle; third cubital not so broad as second. Legs black, with white hair, the spurs clear ferruginous; front coxæ not spined. Abdomen broad, moderately shining; first tergite large, almost impunctate, with long white hair on basal part; second very finely and quite densely (especially at sides) punctured, with a narrow band of white hair at extreme base, and rather broad apical bands on tergites 2 to 4; ventral segments with narrow shining margins.

Longs Peak Inn, Colorado, 9600 ft., July 19 (*W. P. Cockerell*).

Allied to *C. eulophi*, Rob., but smaller, with sculpture of first tergite different.

Colletes rufocinctus, sp. n.

♂.—Length about 7·5 mm., anterior wing about 6·5 mm. Black, including legs (but spurs red), the apical margin of first abdominal tergite bright copper-red; hair of head and thorax long and abundant, white, very faintly creamy on scutellum; mandibles with apical half rufous; malar space longitudinally striate, twice as wide as long; labrum polished; clypeus hidden by the long white hair; top of cheeks polished; antennæ of the long type, flagellum obscurely brownish beneath; fourth antennal joint longer than third, but not so long as second and third together; third joint and base of fourth conspicuously black, contrasting with the brown beyond; mesothorax strongly punctured, in posterior middle the punctures are widely spaced; base of metathorax with the usual plicæ, but they are irregular; tegulæ rufo-testaceous. Wings hyaline, stigma dull ferruginous, produced into marginal cell; nervures fuscous; second cubital cell very broad, receiving recurrent nervure beyond middle. Legs with white hair; tarsi rufescent at apex. Abdomen shining, strongly punctured; white hair-bands on all the tergites, all but the first very broad and dense.

Between Longs Peak Inn and Estes Park Village, Colorado, August (*Cockerell*).

Related to *C. eulophi*, Rob., but the colour of the pubescence is entirely different. In my table of males (1905) it runs nearest to *C. gypsicolens*, Ckll. It also resembles *C. spurcus*, Vier., differing by the red stigma, first recurrent nervure beyond middle of second cubital cell, and red margin of first tergite. *C. geranii* (Ckll.) is also closely related, but has a much longer malar space.

Colletes nitidicaudus, sp. n.

♂.—Length about 7·3 mm., anterior wing 6 mm.

Black, including legs and antennæ (flagellum faintly brownish beneath); mandibles rufescent apically; malar space wider than long, but not twice as wide as long; fourth antennal joint hardly longer than third; antennæ of the long type; clypeus closely punctured; hair of head and thorax long, white, tinged with brownish grey on vertex and thoracic dorsum; mesothorax weakly punctured, the posterior disc polished and practically impunctate; scutellum shining; metathorax shining at base, the plicæ rather closely placed; tegulæ black. Wings hyaline, almost milky, stigma and nervures practically black; stigma well produced into marginal cell; second cubital cell very broad, receiving recurrent nervure much before middle. Legs with white hair, spurs rufous. Abdomen highly polished, finely punctured, the punctures on first tergite extremely weak and small; dull white apical bands on all the tergites, these not very broad; venter with strong white bands.

Longs Peak Inn, Colorado, July 19 (*W. P. Cockerell*).

In my table of males it runs to the vicinity of *C. gaudialis*, Ckll., which is a much larger Californian species.

Augochlora (*Odontochlora*) *seitzi*, sp. n.

♀.—Length about 8·5 mm., anterior wing 7 mm.

Robust, bright Prussian-green, the abdominal tergites narrowly black apically, and purple just before the black; pubescence dull white, scanty and short; mandibles black (very faintly reddish subapically), the apical part very broad, elbowed, strongly bidentate; labrum black; clypeus convex, shining, the lower margin black, depressed in middle; sides of face more golden green, very densely punctured; front dull; antennæ black; mesothorax and scutellum dullish, excessively minutely and densely punctured; basal area of metathorax shining, with very fine radiating striæ; mesopleura very densely punctured; tegulæ anteriorly pallid, subhyaline, posteriorly shining black. Wings faintly dusky, stigma and nervures dilute sepia; basal nervure falling short of nervulus; first recurrent meeting second intercubitus. Legs dark brown, anterior coxæ green, trochanters black, femora green behind; the other coxæ also green; mid-femora greenish apically; hind spur appearing simple, microscopically nodulose. Abdomen shining, very finely punctured, not vibrissate; a large area at each side of first tergite extremely brilliant green; apex with dark fuscous hair; venter dark rufo-fuscous, the margins of the segments shining, with a slight golden tint. The base of the venter is spined, the spine acute.

Santos, Brazil (*Dr. Seitz*).

Given to me by Mr. J. D. Alfken, who asked me to ascertain whether it might be *A. urania*, Smith, and to describe it if new. *A. urania* is smaller, and has the head and thorax brassy green, the wings rufo-hyaline. The only genuine *A. urania* I have seen are four specimens in the Hope Museum at Oxford. I compared it with various other *Odontochlora*, described by Vachal, Schrottky, and myself, but it did not agree with any. In Schrottky's table it runs near to *A. phoemonoe*, Schrottky, which is quite differently coloured, and with strongly reddish wings.

Andrena timberlakei, sp. n.

♂ (type).—Length scarcely 5 mm.

Black, head very large, with a very broad face, the clypeus light yellow with two black spots, very low and wide, pointed laterally; malar space linear, at its posterior end a small projecting stout spine; mandibles long and falciform, simple; process of labrum low, broad, and truncate; cheeks very broad, obtusely rectangulate posteriorly below; antennæ long, flagellum very faintly reddish beneath; third antennal joint a little longer than fourth; front dull; face and cheeks with long white hair; thorax small; mesothorax shining and strongly sulcate in middle, the surface microscopically tessellate and with very widely scattered excessively minute punctures; thorax with white hair, pale reddish dorsally, conspicuously so on scutellum; area of metathorax dull, without special sculpture. Legs slender, black; stigma large; basal nervure falling short of nervulus; second cubital cell nearly square, receiving recurrent nervure a little beyond middle; third cubital cell over twice as long as second. Abdomen narrow fusiform, hind margins of segments hyaline, apex with light rufous hair.

♀.—Length slightly over 5 mm.

Head and thorax black, not at all metallic; abdomen brownish black, hind margins of segments pallid; clypeus laterally dull, but shining in middle, with strong widely separated punctures; labrum very large, its process obtusely subangulate, transversely plicate; facial foveæ brownish, occupying a little over half space between antenna and eye, extending upward to level of ocelli, and narrowly downward to about level of antennæ; mandibles dull reddish, black at base; flagellum pale dull ferruginous beneath, except at base; third antennal joint fully as long as next two together, the fourth very short; face, cheeks, pleura, and metathorax with white hair, vertex and thoracic dorsum with brown hair, extremely short on mesothorax, which is dull, though the scutellum is moderately shiny. Legs black, with pale hair; hair on outer face of hind tibia plumose, rather thin; tegulæ dark reddish. Wings hyaline, faintly dusky, stigma dull yellowish. Abdomen dullish, without distinct hair-bands, the surface microscopically lineolate, and with excessively minute piliferous punctures; hair at apex reddish; second abdominal segment without a distinct apical depression.

Riverside, California, at flowers of *Cryptanthe intermedia*, March 3 and 5, 1929 (*P. H. Timberlake*).

Mr. Timberlake calls attention to certain special features of the male:—"The arcuate vertical margin of head with the hump at middle behind ocelli; the large opaque spot on each side of vertex, and the little spine on the cheek anteriorly, close to base of mandible. This spine varies greatly in length, and is sometimes a mere tubercle." In the Californian fauna this is perhaps nearest to *A. subtilicornis*, Vier., but that (male) is larger and has a dark clypeus. The species is an isolated one, and appears to me to be closely related to Robertson's subgenus *Opandrena*. In Robertson's key, it is excluded from *Opandrena* because the scopa of the hind legs is plumose; but I observe that female *A. cressonii*, Rob., the type of *Opandrena*, has a little group of plumose hairs on the outer side of hind tibia at base.

XYLOCOPIDÆ FROM SIAM.

I am indebted to Dr. and Mrs. James W. McKean and Dr. A. F. G. Kerr for some very interesting carpenter bees recently collected in Siam. A series of five specimens from the Chiengmai region presents a most extraordinary case of what is known as Müllerian mimicry. They differ in size and robustness, but all these bees are black, with the wings most beautifully coloured, the basal half of the anterior wings purple, tending to blue-green, the apical portion golden green. Thus, at first sight, they seem to belong to one rather variable species, but as a matter of fact they represent two genera and four species, as follows:—

Mesotrichia tenuiscapa (Westwood).

Chiengmai, May 11, 1928, 2 ♀ (*McKean*).

These are typical of the species, with the magnificent wing-coloration normal to this form. Anterior wing 25–27 mm. long.

Mesotrichia latipes (Drury), var. *magnifica*, nov.

Doi Sutep, near Chiengmai, March 23, 1928, 1 ♀ (*McKean*).

Anterior wings 32 mm. long, the basal half blue-green and purple, apical part golden green, the colours as in *M. tenuiscapa*. Length of third cubital cell 5·4 mm. (in *M. tenuiscapa* 4 mm.); scape broadened apically; hind coxæ apically flattened, the margin rounded; third antennal joint shorter than in *M. tenuiscapa*. I wondered whether this could be the *Xylocopa latreillii*, Lep., which had similarly coloured wings. In both sexes Lepeletier makes *X. latreillii* larger than "*latipes*," and his account of the hind coxæ seems to agree with *M. latipes*. Smith thought his "*latipes*" was really *tenuiscapa*, and in his Catalogue placed *latreillii* under true *latipes*. Later writers cite *latreillii* as a synonym of *tenuiscapa*, and the description of the male scape confirms this reference. Thus it seems that *X. latreillii* was at least in part *M. tenuiscapa*, and it does not seem desirable to apply the name to a variety of *M. latipes*, though that variety may have been included in the original series. I saw *X. latreillii* in the Hope collection at Oxford, but made no notes.

Xylocopa iridipennis, Lep., var. *semipurpurea*, nov.

Chiengmai, May 11, 1928, 1 ♂ (*McKean*).

Anterior wings 25·5 mm. long, the basal part purple and blue-green, the broad apical margin golden green; scutellum with sparse strong punctures; face-markings ivory-colour, apical margin of clypeus broadly black, the black with a small pointed median extension upward; a lunule on each side of middle ocellus; sides of thorax with a large spot of shining creamy-white hair, and mesothorax anteriorly with an inconspicuous band of pale hair.

Xylocopa auripennis, Lep., var. *phenachroa*, nov.

Chiengmai, May 11, 1928, 1 ♀ (*McKean*).

Anterior wings 21·8 mm. long, coloured exactly as in the last variety; scutellum with smaller and more numerous punctures than in *X. iridipennis.*

Regarding this as a case of mimetic resemblance, *M. tenuiscapa* must be the "model," as it does not deviate from its usual coloration.

Xylocopa collaris, Lep.

Chiengmai, May 11, 1928, 1 ♀ (*McKean*).

Xylocopa (*Nyctomelitta*, subgen. nov.) *tranquebarica* (Fab.).

Chiengmai, May 11, 1928, 1 ♀ (*McKean*).

The subgeneric name *Nyctomelitta* is proposed for these large red-haired bees, with nocturnal habits and greatly enlarged ocelli. The present species is the type, but *X. grandiceps*, Cam., goes in the same subgenus.

Mesotrichia confusa mckeani, Cockerell.

Chiengmai, May 11, 1928, 3 ♀ (*McKean*).

Miss N. Le Veque finds that this form, like the similar Australian one (*M. bryorum*, Fb.), has no pouch for mites in the abdomen. Typical *M. confusa*, Pérez, has a pouch. It seems probable that *M. mckeani* should be regarded as a distinct species.

Mesotrichia flavonigrescens (Smith).

Kau Chang, Ranawng, Siam, Jan. 10, 1929, 1 ♂ (*Kerr*).

Meade-Waldo treated *M. malayana* (Cam.) as a synonym of this, but, although it is very closely allied, it is readily separated by the white hair at sides of face and front. In *M. flavonigrescens* this hair is yellow.

Mesotrichia kerri, sp. n.

♀.—Length 25–28 mm., very robust, width of abdomen in the larger (type) specimen 14·2 mm.; anterior wings 20–22 mm. long.

Entirely black, with black hair; thorax above mainly bare, highly polished and shining; flagellum obscurely reddened or marked with red beneath. Wings opaque, magnificent golden-green, at base with strong crimson tints, the apical field also suffused with coppery red. The wing-colours are similar to those of *Xylocopa orichalcea*, but brighter and differently arranged. Clypeus smooth and elevated in middle, laterally with well-separated strong punctures;

vertex with strong well-separated punctures and a median ridge; third antennal joint longer than next three together; scutellum impunctate in middle, laterally with scattered minute punctures, becoming numerous and stronger at extreme sides; abdomen shining, conspicuously punctured, more finely on first segment than on the following ones; hair of hind legs long, coarse, and black.

There is a curious superficial resemblance to the South American *Xylocopa morio callichlora*, Ckll. The bare disc of scutellum and first abdominal segment show that it is not allied to *M. bombiformis*, Sm., a robust black species of the Philippine Islands. Compared with *M. tenuiscapa*, the scape is shorter and less robust, the vertex is very much more closely punctured, while the clypeus is quite different, having a broad elevated shining median area. There is thus no particular affinity.

Siam. Type at flowers of *Melastoma*, Kao Pawta Changotong, Ranawng, Jan. 21, 1929 (*Kerr*). Also one from Doi Sutep, 5500 ft., March 23, 1928 (*McKean*).

Named after Dr. Kerr, Government Botanist, who by his numerous discoveries has revealed to us the wonders of the Siamese flora. The species of *Melastoma* are very characteristic of this region. Going by rail from Bangkok to Singapore, I noticed the brilliant flowers, suggesting rhododendrons from a distance. Near Singapore the species is *M. polyanthum*, Bl.; northward it is *M. melabathricum*, L., but superficially they appear alike. Miss Le Veque has examined the Doi Sutep, *M. kerri*, and finds it to contain *Paragreenia* mites.

MISCELLANEOUS.

Entomobrya atrata, *nom. novo for* E. nigrina, *Womersley*.

By H. WOMERSLEY, F.E.S.

HAVING recently obtained a separate of Dr. R. Latzel's paper on 'Neue Kollembolen aus den Ostalpen und dem Karstgebiete" of 1916, I find that he used the specific name *nigrina* for another species of this genus. I now, therefore, withdraw the name for the species described by myself from Devonshire ("Some Records of Apterygota from Lundy Island, Devonshire, with the Description of a new Species of *Entomobrya* (Collembola)," Ann. & Mag. Nat. Hist. ser. 10, vol. ii. p. 62, July 1928). In its place I substitute hat of *atrata*.

Sunny Meads, West Town, Somerset,
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XXXIII.—*On the Families of Coleoptera related to the* Erotylidæ, *with Descriptions of a new Family, Two new Genera, and a few new Species.* By GILBERT J. ARROW, F.Z.S., F.E.S.

THE Cryptophagidæ appear to be a rather primitive Clavicorn group, which has branched in many directions, giving rise to various other groups, which, in their more highly modified forms, are remarkably diverse, but the actual limits of which it is extremely difficult to fix. The Cucujidæ, Colydiidæ, Mycetophagidæ, Erotylidæ, Languriidæ, Endomychidæ, and even some Heteromerous families, in their less specialised and generally minute representatives, all show almost imperceptible transitions from a Cryptophagid type.

In Ganglbauer's great work, 'Die Kafer von Mitteleuropa,' which contains the best classification of these multitudinous forms likely to appear in our time, the family Erotylidæ includes the Cryptophaginæ as a subfamily, while the Languriidæ, which, not occurring in Europe, are not actually dealt with in the work, are mentioned as another subfamily. Catalogues which have since been published by Junk have treated Erotylidæ and Cryptophagidæ as separate families, and, as the whole of the literature dealing with them so treats them, it is practically convenient to regard Ganglbauer's subfamilies as families. This plan was adopted in a volume recently published by me upon the Indian representatives ('Fauna of British India' Series, 1925). In that volume I defined the Languriidæ to the best of my ability and gave characters for their separation from the Cryptophagidæ, but the study of genera belonging to other faunas has shown those characters to be inadequate for the separation of the groups as a whole, which it now appears to me necessary to largely recast.

Another object of the present notes is to point out important omissions and errors in the two Catalogues just referred to, which have occurred as a result of their having been independently compiled.

Within the Cryptophagidæ are at present included genera with simple 5-jointed tarsi (sometimes heteromerous in the males), others heteromerous in both sexes, and others again with the third joint lobed and the fourth minute and nodiform. The last is the condition normally occurring in the Erotylidæ and Languriidæ. The Erotylidæ have always completely closed front coxal cavities, whereas in the Languriidæ and Cryptophagidæ these are open, except in certain genera which, for that reason, were transferred to the Erotylinæ by Ganglbauer under the group-name of Diphyllini. Some of the species of this group are included in the Junk Catalogue of Erotylidæ, others appear in that of the Cryptophagidæ, and a considerable number have been omitted from both. The group consists of a large number of species distributed throughout the world, and has little resemblance to the Erotylidæ except in its closed coxal cavities. The tarsi are of peculiar narrow form, without the flat soles distinctive of most Erotylidæ, but the third joint (and sometimes also the second) is produced beneath into a membranous process, which, instead of forming a broad pad, as is usually the case, narrows to a slender strip. Another distinctive feature which has not been noticed is the separation of the neck-portion of the head upon its upper surface by a sharp line behind the eyes, sometimes assuming the appearance of a definite fold. This seems never to be found in the Erotylidæ.

It has already been suggested by Sharp (Biol. Centr.-Amer. vol. ii. 1, p. 580) that the group, which he calls Biphyllinæ, might well be regarded as a family, and this appears to me to be the most convenient course to adopt. I therefore call it the family Biphyllidæ, *Biphyllus* being the original form of the name amended by Gemminger and Harold to *Diphyllus*.

The Biphyllidæ are characterised by the closed front coxal cavities, distinguishing them from the Cryptophagidæ and

Languriidæ, the very narrow tarsi, with tapering membranous appendage, the sharp delimitation of the vertex and neck, the usual occurrence of marginal grooves or ridges upon the pronotum and of oblique lines upon the metasternum and basal ventral sternite, in all of which they differ from the Erotylidæ.

The typical genera *Biphyllus* (*Diphyllus*) and *Diplocœlus* were associated by Jacquelin Duval with the genus *Byturus* (Gen. Col. d'Europe, vol. ii.), but Ganglbauer and other writers with later and wider knowledge have rejected his view. M. Falcoz has recently ('Coleoptera,' vol. i. 1925, p. 69) revived Duval's idea upon grounds which are quite inadequate in view of the thorough consideration already given by many writers to the affinities of the genus *Byturus*.

The link between the Biphyllidæ and Cryptophagidæ occurs in the genus *Cryptophilus*, which is without the usual lines or ridges upon head, pronotum, or lower surface, but, upon the whole, this is best regarded as an aberrant member of the Biphyllidæ.

Thallestus, Woll., under which name twelve species are included in the Junk Catalogue of Cryptophagidæ, is synonymous with *Biphyllus* and three African species described by Grouvelle, viz., *B. fulvus* and *sjostedti* (1909), and *B. marshalli* (1911), have been omitted from the Catalogues. The large American genus *Gonicœlus*, with *Anobocœlus* and *Euderopus*, all described by Sharp in the Biol. Centr.-Amer., already quoted, are also omitted, as well as the genus *Althæsia*, of Pascoe, originally attributed to the Mycetophagidæ.

In the last genus the group attains its greatest size and shows a remarkable development of the prothoracic grooves, which communicate with a profound hollow near each hind angle. A similar apparatus is found in certain Endomychidæ (*Danae*, *Stenotarsus*), and it seems probable that some kind of secretion, for defensive purposes or perhaps for securing the goodwill of ants, is discharged into the cavities. Secretory glands on each side of the thorax, apparently for purposes of defence, are found in the Melyridæ and other families of Coleoptera, and may have been more general in earlier times. Paired basal foveæ upon the pronotum, almost invariably present in the Endomychidæ, are not uncommon in many other groups and are possibly the vestiges of such an apparatus, now no longer functional.

The separation of the Languriidæ from the Cryptophagidæ is a more difficult matter than that of the Erotylidæ from either. In studying the Indian Languriidæ I found a pair of stridulatory files present at the back of the head in all the genera most nearly allied to the Cryptophagidæ, and, no such structure being known in any genus assigned to the latter family, I treated this as a convenient means of separation. I now find that this cannot be regarded as an invariable criterion, for in the Telmatophilini (hitherto included amongst the Cryptophagidæ) such files, although absent in the typical genus *Telmatophilus*, are present in the related genus *Loberus*.

A large genus *Hapalips*, formed in 1877 by Reitter, was referred to by him as related both to the Cryptophagidæ and Languriidæ. It was included in the former by Gorham and in the latter by Champion. The latter states (Trans. Ent. Soc. Lond. 1913, p. 96) that its resemblance to the Languriidæ is purely superficial and refers to the absence of stridulatory files as a distinguishing feature. I have since found such files in a genus, *Pseudohapalips*, closely related to *Hapalips* and described by Champion on the same occasion. The only other feature of importance known to me by which it is possible to separate these two families is the tarsal structure. The tarsi of the Languriidæ are lobed and have a minute fourth joint, as in the Telmatophilinæ, hitherto regarded as a section of the Cryptophagidæ, to which *Loberus* belongs. I therefore propose to unite the Telmatophilinæ with the Languriidæ. So nearly are all these forms related that Ganglbauer's plan of treating them as a single family is probably the best, but, as it is probable that equally good reasons exist for uniting with them other families also, a less drastic course seems desirable pending a more comprehensive study. I therefore regard those genera with dilated pseudo-tetramerous tarsi as constituting the family Languriidæ, restricting the Cryptophagidæ to those with simple joints to the feet.

Family Biphyllidæ.

Six species of the genus *Althæsia* are now known, five of them being represented in the British Museum collection, one of these here described as new. The following table will perhaps assist in their identification :—

A. Innermost lateral groove of pronotum not interrupted.	
B. Disc of the pronotum swollen and notched behind.	
b. Disc of the pronotum not swollen or notched behind	*leai*, Blackb.
Elytra not acuminate behind	*pilosa*, Pasc.
Elytra acuminate behind	*acuminata*, sp. n.

a. Innermost lateral groove of the pronotum interrupted in the middle.
  C. Basal groove of the pronotum without median projection.
    Basal fovea very wide, reaching the middle lateral groove .... *arrowi*, Grouv.
    Basal fovea not reaching the middle lateral groove................................ *sericea*, Lea.
  c. Basal groove of pronotum with a median projection .... *maxima*, Lea.

Althæsia acuminata, sp. n.

Fusca, dense brunneo-pubescens, pilis erectis numerosis interspersis, elytris aureo-sericeo-variegatis; ovata, paulo convexa, pronoto lato, margine basali medio valde angulato, sulco basali medio angulato utrinque profundissimo sulcisque duobus lateralibus integris; scutello minuto; elytris sat fortiter parum crebre seriato-punctatis, punctis interioribus minoribus et minus profundis, apicibus acute spinosis, spinis a sutura paulo distantibus, elytrorum marginibus externis sat dense haud longe ciliatis.

Long. 8 mm.; lat. max. 4 mm.

NEW GUINEA: Dorey (*A. R. Wallace*).

This is a large species differing from those hitherto known in having a tooth near but not at the apical angle of each elytron. The pronotum and elytra have a close brown velvety clothing similar to that of *A. pilosa*, with a nebulous pattern changing according to the incidence of the light. As in the other species, the prothorax has deep cavities in the hind angles into which the basal and lateral grooves open. The basal groove, as well as the basal margin, are rather strongly angular in the middle, and the basal border is rather narrow, with a well-marked tooth on each side a little nearer to the hind angle than to the middle. The visible scutellum, owing to the production of the base of the prothorax, is very small. The elytra are rather convex, and bear rows of punctures which are very large and deep in the outer rows, but become finer towards the suture. The posterior edge of each elytron is produced into a sharp tooth at a little distance from the apical angle, which is sharply rectangular. The antennæ are fairly slender, with the club narrow and the last joint about as broad as it is long.

Biphyllus marshalli, Grouv., described in 1911 from specimens collected in S. Rhodesia, has since been found by Mr. R. Turner in Zululand and Pondoland.

It is a large and peculiar species, with a silky-yellow clothing above, which forms a pattern, changing according to the incidence of the light, the fine setæ not being uniformly arranged but lying in different directions. There are also longer and sparser erect hairs uniformly distributed. The eyes are large, separated by little more than twice their radius, and coarsely facetted.

The structure of the sterna will necessitate the eventual separation of this species as a new genus. The prosternum is produced, broad and truncate behind, and fits against the mesosternum, which is broad and transversely rectangular.

Biphyllus turneri, sp. n.

Niger, subnitidus, elytris, pedibus antennisque rufis, elytrorum parte mediana plerumque plus minusve infuscata, corpore toto fulvo-vestito, corporis supra capillis longis, parum densis, absque lineis regularibus; elongato-ovalis, modice convexus, antennis pedibusque parum brevibus, oculis haud magnis, haud grosse granulatis, pronoto fortiter et irregulariter haud crebre punctato, lateribus valde arcuatis, carina valida utrinque minuta, angulis omnibus paulo obtusis, basi trisinuato, medio profunde transverse sulcato; elytris fortiter seriato-punctatis; antennarum clava parva, laxe articulata, articulo ultimo subrotundato, penultimo triangulari.

Long. 2·5 mm.; lat. 1 mm.

Cape Prov., Pondoland: Port St. John (*R. E. Turner*, Sept.).

This species will be easily recognised by its distinctive coloration and the rather long and rough clothing of yellow hair upon the upper surface of the body. The legs and antennæ are fairly slender, and the latter have the third, fourth, and fifth joints distinctly elongate, and the club composed of two loosely connected joints, the last small and round and the preceding one triangular. The pronotum is strongly and very unevenly punctured, and has a sharp raised carina on each side curving round to meet the front margin anteriorly and ending in the hind angle. The elytra bear rows of large deep punctures. The inner coxal lines of the metasternum are very short but strongly elevated, and the outer lines have an almost horizontal direction. The lines of the first ventral sternite are as usual.

Biphyllus dollmani.

Fusco-brunneus, sat dense griseo-pubescens, antennis pedibusque rufescentibus; elongato-ovalis, convexus, antennis pedibusque haud brevibus, oculis magnis, grosse granulatis; pronoto fortiter punctato, lateribus valde arcuatis, carina valida utrinque munito

aliaque antica utrinque paulo recurvata, angulis omnibus obtusis, basi transverse sulcato, medio sat fortiter lobato, elytris fortiter seriato-punctatis, pilis seriatim ordinatis vestitis, antennarum articulis 3° et 4° paulo elongatis, clava haud magna, laxe articulata, articulo ultimo rotundo, penultimo triangulari.
Long. 3–3·5 mm.; lat. 1·5 mm.

N.W. Rhodesia: Mwengwa (*H. C. Dollman*, Nov.).

A rather elongate insect, with fairly slender antennæ and legs, the former with the third and fourth joints distinctly elongate, and the club consisting of two small and loosely connected joints, the last circular and the preceding one triangular. The eyes are large and coarsely facetted, and the pronotum has a lateral carina on each side extending from the front to the hind margin, and also a short inner carina anteriorly, which curves round to the front margin. The elytra bear rows of fairly strong punctures, between which the hairy clothing has a partly linear arrangement. The inner and outer coxal lines of the metasternum are almost parallel.

This seems to resemble *B. sjostedti*, Gr., but is rather smaller, and the inner coxal lines reach the margin of the first ventral sternite.

Biphyllus elegans, sp. n.

Niger, pedibus antennisque ferrugineis, pube recumbente griseo atque flavido, ciliis erectis longibus interspersis, ornatus, elytrorum fascia lata basali, linea postmediana angusta, ad suturam antrorsum angulata maculaque apicali vage limitata flavis; ovatus, convexus, pedibusque antennisque sat gracilibus, harum articulis 3°–5° elongatis, clava laxe connexa, articulo ultimo fere rotundato, penultimo triangulari, oculis parvis, sat minute granulatis, pronoto fortiter irregulariter punctato, medio paulo gibboso, antice valde angustato, lateraliter carina integra aliaque brevissima interiori ad marginem anticam conjunctam munito, marginibus lateralibus valde arcuatis, minute serratis, elytris grosse seriato-punctatis, lateralibus fortiter arcuatis, apice conjunctim acuminatis, metasterni lineis internis nullis, externis latissime divergentibus.
Long. 2·5 mm.; lat. 1·25 mm.

Cape Prov., Pondoland: Port St. John (*R. E. Turner*, Sept.).

The very distinctive pattern in the hairy clothing of the elytra renders this easy to recognise. The elytra are crossed by two dark wavy bands, one near the middle and one behind it, separated only by a narrow wavy line of pale yellow hairs. The anterior part of the elytra, extending at its widest part to nearly a third of their length, is clothed with hair of the same pale colour, and the extremity bears a small irregular patch of similar hairs. The shape of the body is rather shorter and more ovate than usual, with the head small, and the extremity rather pointed. The punctures upon the pronotum and elytra are coarse, but those of the elytra are regular and nearly uniform. The lines upon the lower surface are nearly the same as in *B. turneri*, but in addition a nearly complete oblique line is present on each side of the second ventral sternite.

Biphyllus clavatus, sp. n.

Rufo-brunneus, elytris, margine basali excepto, obscurioribus, pilis antice fulvis, postice griseis, modice dense vestitus; ovalis, convexus, antennis pedibusque brevibus, tibiis 4 posterioribus latis, extus spinosis; oculis sat magnis, minute granulatis, pronoto bene punctato, medio paulo gibboso, lateribus late marginatis, valde arcuatis, angulis omnibus rotundatis, basi fortiter trisinuato; elytris fortiter subseriatim punctatis et partim seriatim vestitis; antennarum articulis omnibus compactis, 3°–11° transversis, duobus ultimis magnis, ultimo quam penultimum duplo majori; metasterno antice medio profunde excavato, postice bilobato.

Long. 4 mm.; lat. 2 mm.

NATAL: Malvern (*G. A. K. Marshall*, Feb.).

Reddish in colour, with the elytra dark, except at the basal margin, and clothed with fairly close hair, tawny upon the lighter and grey upon the darker parts.

This is a rather broad and massive insect, with short antennæ and legs, the former with a broad compact club composed of two transverse joints, the last twice as long as that preceding it. The eyes are very prominent, and rather finely facetted. The upper surface is rather strongly punctured, some of the elytral punctures forming rows, and there are rows of fine hairs also upon the elytra. The pronotum is very convex, with its sides rounded and the base strongly trisinuate. A peculiar feature of this species is the deep pit between the middle coxæ immediately behind the mesosternum. The metasternum has a deep median groove and is bilobed between the hind coxæ, and there are no inner coxal lines.

Biphyllus corpulentus, sp. n.

Totus ferrugineus, longe sat dense rufo-pubescens; ovalis, convexus, antennis pedibusque brevibus, oculis parvis, subtiliter granulatis, pronoto brevi, parce et minute punctato, lateribus valde arcuatis, angulis omnibus rotundatis, elytris leviter haud crebre vix seriatim punctatis; tibiis latis, extus fortiter spinosis; antennarum articulis omnibus brevibus, tertio minuto, 9° brevissimo, 10° et 11° magnis, transversis, inter se proxime connatis. Long. 5 mm.; lat. 2·5 mm.

UGANDA: Entebbe (*C. C. Gowdey*, Feb.).

A large species with short stout legs and antennæ, the tibiæ broad and provided at the outer edge with fringes of stiff spines. The colour is a uniform rusty red, with rather coarse tawny pubescence upon the upper side, exposing a shining surface beneath. The eyes are small and finely facetted. The pronotum bears only fine scattered punctures, the sides are very strongly rounded, but without the usual ridges parallel to the outer margin, and the elytra are irregularly but a little more strongly punctured. The two terminal joints of the antennæ form a large compact club, and the preceding joints from the third to the ninth are very short and transverse. The middle coxæ are narrowly separated, and the metasternum is bilobed between the hind coxæ and has strongly impressed outer, but no inner, coxal lines. The inner and outer coxal lines of the first ventral sternite are parallel to one another.

Family Cryptophagidæ.

Regarding the tarsal structure as the feature of primary importance, the genus *Pharaxonotha*, which, on account of its stridulatory files, I formerly placed in the Languriidæ, must be assigned to the Cryptophagidæ. *Hapalips*, on the other hand, must be referred to the Languriidæ. Two peculiar new genera of the present family are here described.

RHOPALOCRYPTUS, gen. nov.

Corpus longum, convexum, ovale. Pedes haud validi, tibiæ angustæ, tarsi filiformes, postici 4-articulati, ceteri 5-articulati, articulo penultimo minuto. Antennarum clava 3-articulata, magna, plana, articulo ultimo latitudine paulo longiori, quam duos præcedentes conjunctim majori, his valde transversis, articulis tribus basalibus paulo elongatis, 4–8 brevissimis. Prothoracis lateribus rotundatis, basi subrecto, anguste marginato. Scutellum fere semicirculare, antice haud contractum. Prosternum postice truncatum, perpaulo dilatatum. Acetabulæ anticæ haud occlusæ. Mesosternum postice inter coxas angustatum. Metasternum antice obtuse angulatum, postice medio minute excisum. Mandibulæ bifidæ, intus dentatæ; palpi breves, maxillares sat crassi, labiales minuti.

Rhopalocryptus pulcher, sp. n.

Fulvus, nitidus, pronoti vitta mediana, elytrorum vitta suturali dimidioque antico vel macula utrinque magna humerali, corporisque subtus meso- et meta-sterno nigris, pedibus pallidis, antennarum stipite fulvo, clava nigra: longe ovalis, capite fortiter punctato, oculis prominentibus, sat minute granulatis; pronoto sat fortiter minus crebre punctato, lateribus valde arcuatis, elytris sat regulariter seriato-punctatis, lateribus leviter arcuatis, prothorace subtus, metasterni abdominisque lateribus sat fortiter punctatis.

Long. 3–3·5 mm.; lat. 1·5 mm.

SUMATRA: Fort de Kock, 920 m. (*E. Jacobson*).

This genus is rather nearly related to *Pharaxonotha*, a genus possessing stridulatory files. In addition to the absence of such organs, *Rhopalocryptus* differs in having smaller, more prominent, and much more finely facetted eyes, and in the very different form of its antennæ. These are more slender and elongate at the base, the first three joints being produced, the succeeding five very short, and the last three form a very large flat club, the ninth and tenth joints very broad and produced a little more on the inner than on the outer side, and the terminal joint slightly longer than it is broad, and larger than the two preceding joints together. The prothorax is more rounded at the side and more contracted at the base than that of *Pharaxonotha*, and, as is not unusal in the family, the curvature is not quite regular. The scutellum is not very short and transversely oval as in the other genus, but is nearly semicircular in shape.

In addition to the very peculiar form of the antennæ the distinctive coloration renders *R. pulcher* easy to recognise. The head, the sides of the pronotum, a large oval patch upon the posterior half of each elytron, the legs, and the footstalk of the antennæ are bright yellow, and the remainder black.

Six specimens were found in a decaying inflorescence of *Colocasia indica* by Mr. Edward Jacobson, to whom the British Museum is indebted for this interesting insect.

XENOCRYPTUS, gen. nov.

Corpus ovale, depressum. Pedes breves, femora lati, ad receptandum tibiarum sulcati. Tibiæ subtriangulares, apice truncatæ. Tarsi 5-articulati, breves, articulis tribus basalibus subtus paulo deplanatis, pubescentibus, decrescentibus, quarto minuto, libero, quinto sat longo. Coxæ omnes anguste separatæ, anticarum acetabulis postice haud occlusis, processu prosternali producto, rotundato. Mesosternum postice anguste bifurcatum. Metasternum postice medio acute excisum. Abdomen 5-segmentatum, segmentum basale reliquis paulo longior. Antennæ breves, 11-articulatæ, articulis 3 ultimis paulo majoribus, laxe connexis. Oculi haud magni, grosse granulati. Frons ab vertice linea recta distincta divisa. Vertex carinis duabus longitudinalibus distantibus stridulatoriis instructus. Clypeus sat latus, antice rotundatus. Labrum breve. Mandibula brevis, apice minute bidentata. Maxillæ lobis 2 subæqualibus, muticis, palpo sat gracili. Mentum late triangulare, medio acute dentatum, ligula lobis 2 membranaceis prædita, palpis brevibus, articulo ultimo breviter ovali.

Xenocryptus tenebrioides, sp. n.

Totus rufo-brunneus, antennarum clava paulo pallidiori, subopacus, ovalis, parum convexus, capite pronotoque æqualiter sat crebre punctatis, hujus lateribus et basi anguste sed fortiter marginatis, lateribus leviter rotundatis, angulis omnibus obsoletis, scutello lato, brevi, postice vix angulato; elytris leviter striatis, striis punctatis, interstitiis lævissime convexis, minute sed distincte punctulatis, punctis brevissime et parum perspicue setiferis, corpore subtus sat crebre punctato, sparse et brevissime sericeo.
Long 4·5 mm.; lat. 2 mm.

West Australia: Albany (*H. J. Carter*), Mundaring (*G. E. Bryant*, July), Kalamunda (*R. E. Turner*, March), Champion Bay (*Du Boulay*).

Uniformly reddish brown, not shining, oval and a little depressed, with very short antennæ and legs. The antennæ are scarcely longer than the pronotum, the joints scarcely as long as broad, except the third, which is a very little longer. The last three form a very loosely-articulated club, its terminal joint nearly round and the two preceding semicircular. The legs are short, the tibiæ dilating from the slender base to the extremities, where they are broad and truncate. The five-jointed tarsi have the three basal joints short, a little flattened and successively diminishing in width, the fourth minute, but not covered by the third. The front tarsi are a little broader than the rest. The clypeus is broadly rounded, the eyes are small, prominent, and coarsely facetted, and the lateral margin of the head is carried past the eye and continued as a sharp line of demarcation between the forehead and the occipital region. The latter (usually concealed within the prothorax) is smooth, and bears a pair of longitudinal stridulatory files, parallel and rather far apart. All the angles of the pronotum are rounded off, its sides and base are narrowly margined, and there are only minute vestiges of lateral foveæ. The elytra have sharp lateral carinæ and complete horizontal epipleuræ, and are conjointly rounded behind.

This anomalous insect seems to be fairly common in Western Australia.

In appearance it rather closely resembles *Tribolium* and related genera of Tenebrionidæ, but its real relationship is to the Cryptophagidæ and Languriidæ, to either of which it might be assigned as an aberrant member with almost equal reason. Like *Pharaxonotha*, it has a pair of stridulatory files upon the back of the head, and a sharp dividing-line between the forehead and the posterior portion. The tarsi, however, are extremely peculiar, neither simple and slender for running swiftly, as in Cryptophagidæ proper, nor flattened to give a grip upon smooth surfaces, like those of normal Languriidæ, but short and stout, with the three basal joints short, flattened beneath, and diminishing from first to third, the fourth small but separate. As no genus is known to me more nearly related to this insect than *Pharaxonotha*, I consider it best to treat it as an aberrant Cryptophagid.

Family Languriidæ.

Genus PLATYCLADOXENA.

In the volume already mentioned of the 'Fauna of British India' (p. 256) I have characterised a genus *Thallisellodes* for *Thallisella malasiæ*, Crotch, and four Indian species. In the same work I treated *Platycladoxena* of Kraatz as a synonym of *Microlanguria*, his *P. borneensis* being, in my opinion, identical with the type of that genus. An examination of the type-species of Kraatz's genus (*P. castanea*) reveals that that insect and *P. javanica*, Kr., are actually congeners of *Thallisellodes*, which name must therefore sink. Another synonym of this genus is *Bolerus* formed by Grouvelle in 1919 for three Malayan species. Dr. Heller has tabulated five species of the genus known to him (Wien. Ent. Zeit. 1918, p. 33), including *borneensis*, Kr. Excluding that species for the reason given above, the genus now consists of the following known species, but it will be found eventually to contain a much larger number:—

P. apicalis, Grouv., *angulosa*, Arr., *bouchardi*, Grouv., *castanea*, Kr., *javanica*, Kr., *lateralis*, Arr., *malasiæ*, Cr., *nigripennis*, Arr., *philippinensis*, Hell., *piceola*, Fairm., *ruficollis*, Arr., sp. n., *sumatrana*, Kr., and *transversa*, Gorh.

Platycladoxena ruficollis, sp. n.

Sanguineo-rufa, nitida, elytris (singuli macula subapicali vage ovali excepta), antennarum clava, pedibus (basibus tarsisque exceptis) metasternique lateribus nigris; elongato-ovalis, modice convexa, capite et pronoto laxe punctatis, oculis magnis, pronoto late transverso, lateribus bene marginatis, leviter arcuatis, prope angulos anticos et posticos vix perspicue dentatis, angulis anticis rotundatis, posticis fere rectis, basi lateraliter marginato, medio lobato; elytris sat fortiter, haud profunde seriato-punctatis, punctis parum approximatis, postice minutis, apicibus subtruncatis; corpore subtus distincte sed laxe punctato, metasterno abdominisque basi lineis divergentibus coxalibus impressis; pedibus sat robustis.

Long. 4–5 mm.; lat. max. 1·5–2 mm.

Brit. N. Borneo: Sandakan (*C. F. Baker*). W. Sarawak: Quop (*G. E. Bryant*, Mar., Apr.).

Although differing in many respects, this is evidently related to *P.* (*Thallisella*) *malasiæ*, Cr., of which the coloration is almost the same. The elytra of that species have a common red transverse patch, but in *P. ruficollis* there is usually an elongate patch upon each, although the two may become fused. The legs of Crotch's type are also red. *P. ruficollis* is a much larger insect, with stouter antennæ and legs, larger eyes, the elytra scarcely dilated behind the shoulders, and much less narrowed behind. The shape of the body is more that of *P. javana*, Kr., but in that the pronotum is larger and the antennæ are much more slender.

A genus which he called *Languriomorpha* was devised by Gorham for the members of this family inhabiting Japan, but, as I have failed to find any distinctive features whatever in these, I included it amongst the synonyms of *Pachylanguria* in 'Fauna of India,' Erotylidæ, etc. 1925, p. 172. I had no opportunity of discussing there the Japanese species, to which eleven names have been given, but which Lewis, in Journ. Linn. Soc. 1883, reduced to seven. After a prolonged study of the large series of specimens collected by the latter in Japan and an earnest effort to discover the distinctive characters pointed out by him, I have entirely failed to distinguish more than three species, and of one of these, *Languriomorpha naræ*, Lewis, said to be represented by four specimens, only the male type-specimen, characterised by the absence of a sharp sutural angle to the elytra and a narrow antennal club, can be recognised as distinct. These features are not mentioned by

Lewis, who has not actually described the species at all. The other two Japanese species are *P. pectoralis*, Wat., distinguishable by the rather prominent front angles of the prothorax and the rounded apices of the elytra, and *P. lewisi*, Crotch, with truncate apices. In the male of *P. lewisi* all the femora bear minute tubercles, but in *P. pectoralis* these are only present upon the front femora.

The synonymy of the species is as follows:—

P. Lewisi, *Crotch*, 1873.
  geniculata, Har., 1879.
  columella, Lewis, 1883.
P. Naræ, *Lewis*, 1883.

P. pectoralis, *Wat.*, 1873.
  convexicollis, Wat., 1873.
  sodalis, Wat., 1875.
  ingens, Lewis, 1883.
  waterhousei, Crotch, 1874.
  nigritarsis, Wat., 1873.

Languria unicolor, Mots., treated as a synonym of *P. nigritarsis*, Wat., by Fowler, is a very minute and not very slender insect, which it seems likely is not really a member of the present group.

Pachylanguria excisa, sp. n.

Nigra vel cyaneo-nigra, parum nitida, prothorace corporeque subtus rufis, prosterni partibus anticis et posticis, mesosterno abdominisque apice nigris exceptis; modice angusta, capite ubique pronotique medio sat fortiter punctatis, hoc brevi, parum convexo, lateribus leviter arcuatis, angulis anticis obtusis, haud productis, posticis acutissime productis, basi transversim impresso, foveis brevibus, profundis, scutello transverso; elytris sat fortiter punctato-striatis, fere parallelis, humeris vix prominentibus, apicibus conjunctim late excisis, angulis suturalibus spinosis, externis haud acutis, corpore subtus subtiliter punctato, metasterni lateribus crebre variolosis; antennarum articulo tertio longo, articulis 4–7 paulo elongatis, 8–11 sat latis.

Long. 16 mm.; lat. 3–5 mm.

INDO-CHINA: Luang Prabang (*R. Vitalis de Salvaza*, May).

A single specimen.

Although nearly related to the Indian *P. collaris*, Cr., this species has many well-marked distinctive features. The colouring is quite different, the upper surface being darker and the lower surface lighter. The prothorax is not quite as short as in that species, but the production of its hind angles and relation to the shoulders of the elytra are the same. The elytra are much more strongly striate, and the broad emargination of their extremities is quite different from anything found elsewhere.

It has been suggested by Gorham (Ann. Mus. Stor. Nat. Genova, vol. xvi. 1896, p. 259) that *Tetralanguroides fryi*, Fowl., may perhaps be a redundant name, based upon a composite specimen, but there is no foundation for the suggestion. The insect, whose recorded habitat is "China" only, has been found in recent years at Hang-chow, and the original specimens were probably from Shanghai. The insect has a deceptive resemblance to the variety *tripunctata* of the very common *Pachylanguria elongata*, F., from which it differs by the narrow antennal club of five, instead of four, joints, as well as the wholly black metasternum and abdomen. The elytra are also darker in colour and a little shorter, and their apices are completely rounded.

Megalanguria gravis, sp. n.

Nigra vel cyaneo-nigra, opaca, pronoto metasternoque flavo-rufis, illius marginibus anticis et posticis punctisque duobus medianis, hujus utrinque puncto marginibusqus nigris; parum elongata, convexa, capite parce punctato, pronoto transverso, medio leviter irregulariter punctato, lateraliter fere lævi, marginibus valde arcuatis, basi constricto, angulis posticis acutis; elytris opacis, subtiliter seriato-punctatis, postice haud callosis, antice sat latis, lateribus convergentibus, fere rectis, apicibus truncatis; processu prosternali fortiter bifido, ramis divergentibus, obtusis.

Long. 15·5–19 mm.; lat. max. 6 mm.

INDO-CHINA, LAOS: Xieng Quang (*R. Vitalis de Salvaza*, May, Aug.), Pou Lan (*R. Vitalis*, May).

This is nearly related to *M. producta*, Arrow, but shorter and broader, and the mesosternum is nearly straight behind, instead of being bilobed. The pattern upon the pronotum also is different. There are two generally distinct and isolated black spots, placed transversely in the middle, and black front and hind borders which do not quite reach the sides. The upper surface is opaque, and there are no callosities upon the elytra, as in *M. metasternalis* and *melancholica*. The clypeus is smooth and almost symmetrical.

♂. The clypeus is about as long as it is wide, bilobed, with the right lobe slightly longer than the left, and the middle a little elevated. The pronotum is strongly convex and narrow at the base. The front legs are elongate, and the tibiæ attenuated beyond the middle.

♀. The clypeus is transverse, and its front margin gently excised. The pronotum is short, narrower in the middle than the elytra at the base, with the hind angles acutely produced.

Genus LACERTOBELUS.

The insect figured by Fowler as *Lacertobelus longimanus*, Gorh., in Wytsman's 'Genera Insectorum,' Languriinæ, pl. i. fig. 12, is evidently not that species, which has the elytra truncate and denticulate and the front femur of the male without the sharp tooth which occurs in the other species, *L. dentipes*. This tooth, although treated as a generic feature by Gorham and Fowler, is not found in any other described species. A good many undescribed species of the genus exist, and two are included here.

Lacertobelus clavatus, sp. n.

Purpureus, violaceus vel viridi-cœruleus: angustus, antice et postice attenuatus, antennis brevibus, clava compacta, latissima, ovali: pronoto parce et subtiliter punctato, elongato, postice leviter angustato, basi marginato: elytris sat fortiter seriato-punctatis, antice et postice minus fortiter, basi sat latis, apicibus truncatis, minute dentatis:

♂, clypeo angustato, convexo, antice subtiliter emarginato, prothorace longiori, pedibus, anticis præsertim, longissimis, femoribus anticis intus biseriatim minutissime denticulatis, clava antennali late ovali:

♀, clypeo fere plano, prothorace paulo elongato, clava antennali latissima.

Long. 10–12 mm.; lat. 2–3 mm.

MALAY PENINSULA: Perak (*W. Doherty*), Singapore (*H. N. Ridley*).

BORNEO, SARAWAK: Quop (*G. C. Bryant*, Feb., Mar., April).

The species seems to be fairly abundant, and is found in the same localities as *L. dentipes*, Gorh., although I have seen no examples from Sumatra. It closely resembles *L. dentipes*, but is of a richer purple or violet colour, and a little larger and more robust in form. It can be most easily recognised by the broad club of the antenna, that of the female broader than that of the male. The elytra are rather more coarsely punctured or pitted than in *L. dentipes*, but the extremities are similarly truncate and toothed. The male has two rows of minute tubercles along the inner face of the front tibia, but is without the single tooth found in *L. dentipes*. The clypeus in the same sex is narrowed and bent into a half-tubular shape.

This is the sole case known to me in which the female has the antennæ more strongly developed than the male.

Lacertobelus furcicauda, sp. n.

Æneus, nitidus, pedibus antennisque brunneus, harum clava nigra; angustus, paulo depressus, pronoto elongato, parce et subtiliter punctato, ante basin constricto, elytris sat lævibus, parce haud fortiter seriato-punctatis, valde attenuatis, basi sat latis, apicibus acuminatis, divergentibus: antennarum articulis omnibus, 9° et 10° exceptis, elongatis, clava angusta, laxe articulata:

♂, clypeo valde angustato, antice acute bidentato, pronoto longiori, antico angustato, pedibus anticis longissimis, femoribus intus biseriatim minutissime denticulatis:

♀, clypeo fere plano, sat lato.

Long. 6·5–9·5 mm.; lat. 1·5–2 mm.

JAVA: Kawah Manoek, Papandajan, Gedeh, 5000 feet.

The specimens were taken by Mr. G. C. Bryant in April.

This species is very distinct by its brassy colouring, rather pale legs, the light and rather scanty puncturation of the elytra, and especially the very acutely pointed and divergent extremities of the elytra. The very loose and narrow antennal club, of which only the ninth and tenth joints are slightly transverse, is also quite distinctive, as well as the sharply bidentate, narrow clypeus of the male.

Doubledaya conjugalis, sp. n.

Viridi- vel cœruleo-ænea, capite et prothorace rufis: angusta, nitida, pedibus sat validis, tarsis longis et latis: pronoto minute et parce punctato, postice angusto, foveis basalibus bene impressis, elytris fortiter crebre seriato-punctatis, retrorsum attenuatis, lateribus fere rectis, apicibus recte truncatis, angulis externis acute spinosis:

♂, pronoto gibboso, paulo elongato, antice et postice fortiter angustato, pedibus anticis elongatis, femoribus intus biseriatim denticulatis:

♀, pronoto valde transverso, antice vix angustato, tarsis anticis latissimis.

Long. 9·5–12 mm.; lat. 2·5–3 mm.

INDO-CHINA, LAOS: Xiang Quang, Luang Prabang (*R. Vitalis de Salvaza*).

This has considerable resemblance to *D. thoracica*, Gorh., from New Guinea, and the coloration is the same. The elytra are a little longer and more attenuated behind, but their apices are truncate and spinose externally in exactly the same manner, and their puncturation is the same. The tarsi of the male are much broader, and those of the female slightly broader. The head of the single female is more unsymmetrical than that of the type of *D. thoracica*, and the pronotum is more strongly transverse and much broader at the front than at the hind margin. In the male the front tibia is not quite so long and slender as in *D. thoracica*, but the rows of minute tubercles upon the femur and tibia are almost the same.

The Central American species of the genus *Crotchia*, all first described by Gorham, are easily distinguished, with the exception of *C. curvipes* and *picea*, which Gorham has not compared and which he was himself unable to separate. The Chontales specimen which he referred doubtfully to *C. picea*, and all that I have seen of those named *C. picea* by him, except a single male, belong to *C. curvipes*. In the single remaining specimen (from Bugaba, Panama), which I take as the type of *C. picea*, the club of the antenna is narrower and less compact, and the tarsus is much paler than the rest of the leg. The front tarsus is not broadly fringed, as in the male of *C. curvipes*, nor the middle tibia strongly curved. In both species the eyes are exceptionally small and far apart.

Types of all the species described in the present paper are in the British Museum.

XXXIV.—*Exotic* Muscaridæ (*Diptera*).—XXVIII. By J. R. Malloch, Bureau of Biological Survey, Washington, D.C.

Family Sapromyzidæ.

Genus Homoneura, van der Wulp.

Homoneura (*Homoneura*) *nubila*, sp. n.

Male and Female.—Glossy black. Frons brownish black, yellowish brown at anterior margin; antennæ brownish yellow, palpi paler, parafacials, cheeks, and occiput brownish yellow, face dull. Thorax and abdomen almost without dusting. Legs dull testaceous, femora and coxæ almost entirely black. Wings greyish hyaline. Squamæ and halteres fuscous.

Frons parallel-sided, about one-third of the head-width, and very little longer than wide, ocellars and postverticals short, orbitals long, all verticals well developed; third antennal segment about 1·5 as long as wide, rounded at apex; longest hairs on arista fully half as long as width of third antennal segment. Thorax with the usual three pairs of postsutural dorsocentral bristles, a pair of well-developed acrostichals in front of the prescutellar pair, sternopleurals two, mesopleura with one hind marginal bristle. Fore femur with the anteroventral comb undeveloped, fine hairs only present instead of spinules; all tibiæ with the preapical dorsal bristle present. Inner cross-vein of wing a little before middle of discal cell; penultimate section of fourth vein about four-fifths as long as ultimate.

Length 4·5–5 mm.

Type, female, Moorea, Society Islands, August 1928; allotype in poor condition, same date (*A. Tonnoir*).

This species is very similar to one occurring in the Samoan Islands, but it is larger, lacks the fore femoral comb, and has the aristal hairs longer.

Family **Muscidæ**.

I include below descriptions on some new species, with a survey of the species of the genus *Limnophora*, Robineau-Desvoidy, found in the Society Islands, as far as my present material permits.

Subfamily *EGINIINI*.

Genus XENOTACHINA, Malloch.

I have received from Dr. J. M. Aldrich, of the United States National Museum, a specimen which I refer to this genus despite some structural divergences from the genotype. The most notable of these is the presence of but two sternopleurals (1+1), and the rather abrupt discontinuance of the sixth wing-vein a little before attaining the margin.

Xenotachina armata, sp. n.

Male.—Shining testaceous-yellow, orbits, face, cheeks, and dorsum of thorax with slight pale dust, the last faintly reddish quadrivittate, the submedian pair most distinct in front of suture. Abdomen with a longitudinal dark brown mark on centre of each tergite, the whole forming a rather conspicuous vitta. Tarsi a little darker than the remainder of legs. Wings greyish hyaline.

Frons at vertex a little less than one-third of the head-width, widened slightly to anterior margin, inner verticals long, outer pair shorter but distinctly longer than the post-verticals and ocellars, upper orbital short and fine, second as long as ocellars; longest hairs on arista not as long as width of third antennal segment; cheek fully twice as high as width of parafacial and nearly one-third of eye-height. Thorax with 2+3 pairs of dorsocentrals, presutural acrostichal hairs short and fine, biseriate, prescutellar acrostichals lacking, only the posterior intra-alar present, sternopleurals 1+1, hypopleural setulæ very short and weak. Abdomen cylindrical, tapered apically, bristles on apices of tergites long and strong. Femora progressively stronger from fore to hind pair, fore pair with short bristles on apical half of anteroventral surface, mid-pair with some stouter bristles on apical third of same surface, hind pair with a series of seven or more very stout blunt bristles from near base to apex, the series on ventral surface basally and gradually running on to posteroventral surface at apex; both the femora and tibiæ are rather copiously furnished with fine hairs and bristles ventrally, most noticeably so on hind legs; fore tibia with one anterodorsal and one posterior bristle; mid-tibia with two posterior bristles; hind tibia with a knife-like ridge on basal third of ventral surface, two anterodorsal, and two posterodorsal bristles. Costa with some outstanding bristles to humeral cross-vein; inner cross-vein noticeably beyond middle of discal cell.

Length 7 mm.

Type, Mt. Omei, Szechuen, China (*D. C. Graham*). United States National Museum.

Subfamily *PHAONINÆ*.

Genus CAMPTOTARSUS, Stein.

In one of the preceding parts of this series of papers I have dealt with this group and indicated that it is entitled, in my opinion, to at most subgeneric distinction within the genus *Helina*, Robineau-Desvoidy. In a recent paper* Strand has proposed the name *Camptotarsopoda* to supplant *Camptotarsus*, Stein, which is pre-empted by the same name of Thorell in Archnida.

While the clerical work entailed in searching out pre-empted names in all groups of animals must be considerable, I hardly consider that it entitles the discoverer to propose new names for organisms which he is absolutely unacquainted with. The slight possibility of confusion does not justify the attachment of one's name to a genus when the only basis for such a course is the mere fact that one has either accidentally or through some expense of time and labour discovered a homonym without adding to the general store of knowledge regarding the organisms involved.

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* Arch. f. Naturges. 1926, Sect. A, viii. p. 48.

Genus PHAONIA, Robineau-Desvoidy.

I have insufficient material in hand at this time to present a key to the South American species of this genus, and below I give a description of a Peruvian species which belongs to a group which is represented by several species in that region, and is rather different from any of the groups in either the Nearctic or Palearctic Regions. The possession of presutural acrostichals is not unique in the genus, but in conjunction with this the pubescent arista, and presence of discal bristles on third abdominal tergite distinguish the group very well from any in the other two regions.

Phaonia peruviana, sp. n.

Male.—Head black, orbits, face, cheeks, and occiput densely whitish-dusted; second antennal segment brownish, third black; palpi yellow. Thorax black, with rather dense whitish-grey dusting, dorsum with four broad black vittæ, humeri and a mark behind suture at bases of prealar and supra-alar bristles testaceous-yellow, scutellum of that colour, but largely infuscated on disc. Abdomen testaceous-yellow, with changeable white dust, a dorsocentral black line, the sides of tergites, and base of fourth visible tergite fuscous. Legs yellow, femora variably stained with brown, the fore pair yellow only at apices, tarsi fuscous. Wings hyaline. Calyptræ and halteres yellow.

Eyes with sparse microscopic hairs; frons linear on upper portion, posterior pair of hairs short, recurved, next two pairs longer and proclinate, anterior three or four pairs mostly strong, incurved; antennæ normal, third segment about 1·5 as long as second; arista pubescent; parafacial not as wide as third antennal segment, and less than half as wide as highest part of cheek; palpi slender. Thorax with 2+4 pairs of dorsocentral bristles, two pairs of long presutural and one short and one long pair of pre-scutellar acrostichals, the prealar long and strong, posterior notopleural short, sternopleurals 1+2, hypopleura bare, supraspiracular convexity downy. Abdomen ovate, all tergites with apical bristles, third and fourth tergites also with discal series, fifth sternite broadly and shallowly emarginate. Fore tibia with a median posterior bristle, mid-femur with some long posteroventral bristles on basal half, mid-tibia with two or three posterodorsal and posteroventral bristles, the lower one on latter surface long, hind femur with fine long ventral hairs and a series of anteroventral bristles, hind tibia with rather noticeable ventral hairs, quite prominent on posteroventral surface especially basally, the calcar long, three anterodorsal and four or five anteroventral bristles. Ultimate section of fourth wing-vein not twice as long as penultimate; first posterior cell not narrowed at apex.

Length 7·5 mm.

Type, Perales. Peru, January 25 (*Perrone*). United States National Museum.

Genus PECTINISETA, Stein.

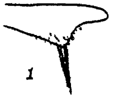
This genus is very similar to *Lispocephala*, Pokorny, the outstanding difference being that the arista of the male is long-haired above and bare below, and that of the female is plumose both above and below, while in *Lispocephala* it is variously haired, but never conspicuously longer-haired above than below in either sex. One species of *Pectiniseta*, which I have recently described in a paper forming part of the 'Insects of Samoa,' has the arista long-haired above and bare below in the female.

Before me there are two species of the genus, one of them the genotype, the other being apparently undescribed and very similar to *P. prominens*, the males being most readily and reliably distinguished by the structure of the processes of the fifth abdominal sternite. I briefly describe the new species below.

Pectiniseta societas, sp. n.

Male and Female.—Fuscous, slightly shining, rather densely dark grey-dusted. Interfrontalia brownish black, triangle and frontal orbits yellowish-grey dusted; antennæ black, third segment in male brownish, paler at base, in female bright orange- or lemon-yellow; palpi testaceous-yellow, darker at bases. Thorax with a more or less evident dark dorsocentral vitta, and sometimes with a trace of a narrower one on each side along the lines of dorsocentrals, the mesonotum usually very slightly shining. Abdomen fuscous, yellowish testaceous to a variable extent at base, and sometimes at apices of tergites, the dorsum with a pair of round black spots on each tergite from second to fourth, or fifth, and a much less evident dark central mark between these; the processes of fifth sternite in male polished, dark brown. Legs testaceous-yellow, coxæ partly fuscous, femora almost entirely black. Wings hyaline. Calyptræ white. Halteres yellow.

Frons in both sexes about one-third of the head-width at vertex, widened slightly anteriorly, triangle extending to anterior margin, each orbit with two upper backwardly curved bristles, and two or three anterior incurved bristles, the ocellars longer than the postverticals; third autennal segment woolly, about four times as long as second, and attaining mouth-margin; palpi slightly dilated; eyes bare. Thorax with 1+3 dorsocentral bristles, the acrostichal hairs in front of suture in two series, sternopleurals three; scutellars four. Abdomen in male short and stout, the hypopygium not very prominent, the fifth sternite with two backwardly directed processes, each of which has a slight angle on lower side near apex which is armed with a fasciculus of short bristles (fig. 1); abdomen in female tapered at apex, without genital spines. Fore tibia without a posterior median bristle; mid-tibia with one submedian posterior bristle; hind tibia with two anterodorsal bristles, the one nearest apex much the longest, one anteroventral bristle, and two short weak posteroventral setulæ, the one nearest apex the least developed. Inner cross-vein of wing close to apex of discal cell.



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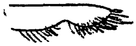

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Fig. 1.—*Pectiniseta societas*: left process of fifth abdominal sternite of male.
Fig. 2.—*Pectiniseta prominens*: ditto.

Length 3–4·5 mm.

Type, male, allotype, and one paratype, Tahiti, 19. vii. 1925; paratypes: three, same locality, 10. iii. 1925; three, Lake Vaihiria, Tahiti, 17–18, vii. 1925; five, Raiatea, 14, 25, and 26. v. 1925 (*L. E. Cheesman*); one Moorea, and one Mataeia, August 1928 (*A. L. Tonnoir*).

Pectiniseta prominens, Stein.

This species, besides having the fifth abdominal sternite in the male as fig. 2, has the thoracic dorsum more densely and paler-dusted and almost without a dark dorsocentral vitta. In size it is similar to the preceding species.

Locality.—One male and two females, Moorea, August 1928 (*A. L. Tonnoir*).

This species occurs in Formosa, the Federated Malay States, and in various other localities in that immediate region as well as in Samoa. Possibly it is of general occurrence in the Pacific region, and it may be that the larvæ occur in decaying fruits and that the species is distributed in commerce, though there is nothing at present known of the larval habits of the genus.

The type-locality is Sokotra, and the type-species was originally described as a *Cœnosia.*

I am depositing in the British Museum a male specimen from Formosa taken by Sauter and given to me by Dr. Walther Horn of the Deutsches Entomologische Museum.

Genus LIMNOPHORA, Robineau-Desvoidy.

I present below a report on the species of this genus from the Society Islands, one of the most diverse assortments I have yet encountered in my collection. It appears worth noting that in the genus *Dichætomyia*, Malloch, species with marked wings are extremely rare and the occurrence of such forms so far recorded is confined to the island of Buru and the Fiji and Samoan Islands. It therefore is noteworthy that in this same general region similarly featured forms occur in another genus of the same subfamily. What factor is responsible for this development of wing-markings in these two genera in this region I do not attempt to suggest, I am merely pointing out the facts without trying to explain the cause, and leave it to others as an interesting problem explicable either as mimicry or due to a reaction to atmospheric or chemical factors in the habitats of the species.

The most exceptional species are in the material collected by Miss Cheesman, the species submitted by Dr. A. L. Tonnoir are not very different from the general run of the species from other regions.

I append below a key for the identification of the species in hand.

Key to the Species.

1. Thorax with four pairs of postsutural dorsocentral bristles, the anterior two pairs usually much shorter than the posterior two pairs.......................... 2.
Thorax with three pairs of postsutural dorsocentral bristles, all equally long .... 5.
2. Dorsum of thorax and scutellum shining black, without broad fasciæ of pale dust,

slightly brownish-dusted on sides in front of suture; wings brownish, most noticeably so along the costa on apical two-thirds .... *subpolita*, sp. n.

Dorsum of thorax with quite conspicuous presutural and prescutellar fasciæ of pale grey dust, in all species very evident when viewed from behind .... 3.

3. Wings entirely hyaline; small species, averaging less than 4 mm. in length; presutural grey-dusted thoracic fascia rather inconspicuous, always more or less distinctly interrupted in middle; frons of male almost one-third of the head-width. *mesolissa*, Bezzi.

Wings with a conspicuous blackish costal streak; larger species, averaging at least 7 mm. in length; presutural grey-dusted thoracic fascia complete and conspicuous; frons of male not one-sixth of the head-width .... 4.

4. Inner cross-vein of wing narrowly, but quite distinctly, clouded with brown; presutural dark mark on mesonotum entire; humeri dark brown in front, the dark mark sometimes connected with the presutural one on mesonotum; most of the stronger bristles on the abdomen inserted in dark brown dots .... *cheesmanæ*, sp. n.

Inner cross-vein of the wing not clouded; presutural dark mark on mesonotum divided by longitudinal grey lines into four parts; humeri entirely grey; no readily evident dark dots at bases of the stronger abdominal bristles .... *brunneicosta*, sp. n.

5. Thorax densely pale grey dusted, with a large dark mark in front of suture on the mesonotum, and a broad black fascia occupying the anterior half of mesonotum behind suture; scutellum black at base; wings entirely hyaline .... *claripennis*, sp. n.

Thorax shining black, without conspicuous presutural and prescutellar pale grey dusted fasciæ; scutellum entirely black.. 6.

6. Wings brownish, most noticeably so apically along costa; abdomen densely grey-dusted in both sexes, with a pair of large subtriangular black spots on each tergite, least distinct on fourth; sternopleurals 1+3, the central posterior one shortest, least developed in the male........... *sternopleuralis*, sp. n.

Wings entirely hyaline; abdomen black, slightly shining, dorsum evenly brownish-dusted and without dark spots; sternopleurals 1+2...................... *nigridorsata*, sp. n.

Limnophora subpolita, sp. n.

Female.—Head black, anterior extremities of frontal orbits, the parafacials, and face whitish-dusted, the first with overlaid brownish dust, frontal triangle and upper orbits shining, interfrontalia deep black; antennæ and palpi black. Thorax shining black, with brownish dust on sides in front of suture, most evident when seen from behind, pleura slightly brownish-dusted, paler in front. Abdomen densely brownish-grey dusted, greasy in all available specimens, but the type shows a pair of large subtriangular brown spots on second and third visible tergites. Legs black. Wings pale brownish, darker along the costa. Calyptræ whitish yellow. Halteres yellow.

Eyes practically bare; frons slightly less than one-third of the head-width at vertex, widened anteriorly, vertex with four bristles, ocellars well developed, each orbit with two upper backwardly curved, and about four anterior incurved bristles and some short lateral hairs, triangle not very sharply defined, ending before the middle of frons; arista with its longest hairs about half as long as width of third antennal segment; parafacial linear in profile. Thorax with 2+4 dorsocentral bristles, four series of presutural acrostichal hairs, anterior intra-alar short, sternopleurals 1+2. Abdomen with discal and apical bristles on visible tergites 3 and 4, genitalia quite densely furnished with stiff hairs, but not thorned. Fore tibia without a median posterior bristle; mid-tibia with two posterior bristles; hind femur with 2–3 preapical anteroventral bristles; hind tibia with one anteroventral and one anterodorsal bristle. Third wing-vein with some setulæ at base above and below, fourth vein slightly curved forward at apex; penultimate section of fourth vein about three-fifths as long as ultimate section.

Length 7 mm.

Type, and two paratypes, Tahiti, 7. v. 1925 (*L. E. Cheesman*); one paratype, Lake Vaihiria, Tahiti, 18. vii. 1925 (*L. E. Cheesman*).

Limnophora sp.

A female specimen in greasy condition which I decline to describe is close to the above one, but the wings are yellowish hyaline, and it does not agree in some other characters.

Length 8 mm.

Locality.—Bora Bora, 19. v. 1925 (*L. E. Cheesman*).

Limnophora mesolissa, Bezzi.

This small species differs from all the others in this collection of which I possess males in having a wide frons in that sex. It is widely distributed in this region, occurring to my knowledge in Fiji, Samoa, and Australia.

Localities.—Tahiti, March, April, June 1925 (*L. E. Cheesman*); Moorea, August 1928 (*A. L. Tonnoir*).

Limnophora cheesmanæ, sp. n.

Male and Female. — Head black, densely whitish-grey dusted except on interfrontalia when seen from above, frontal orbits brownish-dusted posteriorly in female; antennæ and palpi black. Thorax black, densely pale grey dusted, with a large brownish-black mark on anterior margin of dorsum which is usually connected with one on anterior portion of each humerus, a broad black fascia on anterior half of postsutural area, a broad black base to the scutellum, and a dark brown dot at base of some of the larger dorsal bristles; pleura entirely grey-dusted. Abdomen concolorous with thorax, each visible tergite from first to third with a pair of brownish-black subtriangular spots, fourth with a central streak of same colour, and some of the larger bristles inserted in dark brown dots. Legs black. Wings with a dark brown costal streak, narrow proximad of apex of auxiliary vein, from that point to apex extending to, or beyond, second vein on field of wing, broadest in the female, and in that sex with the apex of wing faintly clouded, both cross-veins narrowly but distinctly clouded in both sexes. Calyptræ whitish. Halteres yellow.

Frons of male about 1·5 as wide as third antennal segment, orbits setulose on almost their entire extent, upper part with two fine hairs near level of anterior ocellus, ocellars as long as orbitals, verticals undeveloped; frons of female about one-fourth of the head-width at vertex, widened anteriorly, armature differing from that of *L. subpolita* in having only three pairs of incurved anterior orbitals; arista with its longest hairs nearly as long as width of third antennal segment. Thorax as in *L. subpolita*, but the anterior intra-alar is as long as the posterior one. Third and fourth visible abdominal tergites with strong discal and apical bristles; genitalia of female with fine hairs. Wings as in *L. subpolita*. Mid-tibia sometimes with three posterior bristles in the female.

Length 7–9 mm.

Type, male, allotype, and two female paratypes, Raiatea, 31. v. 1925, two female paratypes, same locality, 29, v. 1925, and 4. vi. 1925 (*L. E. Cheesman*).

Dedicated to the collector.

Limnophora brunneicosta, sp. n.

Female.—Superficially very similar to the next preceding species, differing in thoracic and wing markings as indicated in the preceding key as follows: Frontal orbits with four or five pairs of anterior incurved bristles, anterior intra-alar small or absent, costal cloud more sharply limited, cloud on outer cross-vein of wing very faint.

Length 8 mm.

Type, Tahiti, 8. viii. 1925 (*L. E. Cheesman*). One specimen.

Limnophora claripennis, sp. n.

Male and Female.—This species is very similar to the next preceding one in colour except that the wings are entirely clear.

Structurally it differs from *L. brunneicosta* in having three pairs of postsutural dorsocentral bristles, and in being smaller. The frons of the male at narrowest point is about as wide as the third antennal segment, the orbits are bristled on their entire extent below level of ocelli, the ocellars are weaker than, and about as long as, the orbitals, the verticals are undeveloped in male; the frons of female is the same as in *L. brunneicosta*; arista a little shorter-haired than in that species. Anterior intra-alar very short; sternopleurals 1+2. Third and fourth visible abdominal tergites with discal and apical bristles in both sexes; genitalia of female not thorned. Legs as in *L. subpolita*, but the male has a series of short fine bristles on basal two-thirds of posteroventral surface of hind femur. Venation of wings as in *L. subpolita*.

Length 6–7·5 mm.

Type, male, Tahiti, 15. iv. 1925, allotype and two male paratypes, same locality, 9. vii. 1925; one male and three female paratypes, 18. viii. 1925, and one female paratype, 19. vii. 1925 (*L. E. Cheesman*).

Limnophora sternopleuralis, sp. n.

Male and Female.—A darker-coloured species than the next three preceding, more closely resembling *L. subpolita*.

Head black, frontal orbits grey in the male, brownish-dusted in the female except at anterior margins where they are pale grey, parafacials and face pale grey dusted, occiput darker grey; antennæ and palpi black. Thorax shining black, dorsum with faint indications of vittæ, the lateral presutural margins greyish-dusted, pleura grey-dusted, scutellum black. Abdomen black, densely grey-dusted, all tergites with a pair of black subtriangular spots, those on fourth tergite less clearly defined in male, small or lacking in female, some of the larger bristles on fourth tergite set in small dark dots. Legs black. Wings slightly infuscated, quite noticeably darkened towards costa, especially in the female. Calyptræ brownish yellow. Halteres yellow.

Eyes bare; frons of male linear above, orbits setulose on anterior third and with a hair on each near anterior ocellus, ocellars as large as the longest orbital, verticals undeveloped; frons of female as in the preceding species; arista with its longest hairs aboat half as long as width of third antennal segment. Thorax with 2+3 pairs of long dorsocentral bristles, both intra-alars long, sternopleurals 1+3, the central posterior one small, especially in the male. Abdomen with discal and apical bristles on tergites 2 to 4, those on disc of second small, especially in the female, the apical bristles on fourth tergite in that sex short and fine. Legs as in the other species, the male with an almost complete, but sparse, series of bristles on anteroventral surface and a few bristles at base of posteroventral surface of hind femur. Wings as in the other species.

Length 7·5–8 mm.

Type, male, allotype, and one female paratype, Tahiti, 7. v. 1925 (*L. E. Cheesman*).

Limnophora nigridorsata, sp. n.

Male.—Similar in general colour and habitus to the next preceding species, but much smaller, with the abdomen uniformly rather dull brownish black on dorsum, the wings entirely hyaline, and the calyptræ fuscous, with darker margins.

Structurally there is little difference between the two species, but the head in the present one is smaller, the bristles are weaker throughout, the central posterior sternopleural is undeveloped, and the only bristles on the hind femur are two or three preapicals on the anteroventral surface. The type-specimen has no distinguishable hairs at base of the third wing-vein, but this may be an abnormality, as all the species of the genus known to me have such hairs.

Length 4·5 mm.

Type, Papeete, July 1928 (*A. L. Tonnoir*).

Genus Ophyra, Robineau-Desvoidy.

Ophyra chalcogaster (Wiedemann).

Three specimens of this widely distributed species, Tahiti, 8. viii. 1925 and 9. vii. 1925 (*L. E. Cheesman*).

Family Calliphoridæ.

Subfamily *CALLIPHORINÆ*.

Genus PHUMOLUCILIA, nov.

This genus is closely related to *Phumosia*, Robineau-Desvoidy, and superficially it is very similar to *Lucilia nigricosta*, Malloch. It will run down to the caption in my recently published key to the genera of this subfamily which contains those genera in which the supraspiracular convexity has rather long erect hairs. From *Obscuria*, Malloch, it is distinguished by the presence of four bristles on the presutural lateral area of thorax, a strong pair of prescutellar acrostichals, and two hairs on lower central portion of the face. From both *Phumosia* and *Paratricyclea*, Villeneuve, it is at once distinguished by the lack of presutural acrostichals and the *Lucilia*-like head with its bare parafacials.

Genotype, the following species.

Phumolucilia costata, sp. n.

Male.—Head black, orbits, face, cheeks, and occiput white-dusted, antennæ and palpi fuscous. Thorax and abdomen metallic violet-blue, mesonotum slightly white-dusted, pleura largely black, fourth visible tergite of abdomen slightly white-dusted. Legs black. Wings greyish, with a dark brown costal mark from base to apex of submarginal cell, extending over field of wing to, or beyond, middle of that cell. Calyptræ fuscous, white at junction. Halteres fuscous.

Eyes bare, facets enlarged in front; frons linear at middle, setulose on anterior two-thirds, ocellars and inner verticals developed; parafacial not as wide as third antennal segment above, gradually widened below, without any hairs; third antennal segment about 2·5 as long as second; arista plumose; face with two hairs near lower margin in centre; facial ridges setulose on lower half; vibrissal angle slightly produced; cheek nearly as high as length of third antennal segment. Thorax with 2+4 dorsocentrals, the two anterior pairs behind suture short and fine; no presutural acrostichals; one pair of strong prescutellar acrostichals; the prealar rather long; four bristles on the presutural lateral area; prosternum, propleura in centre, supraspiracular convexity, centre of postalar declivity, anterior extremity of the suprasquamal ridge, and postnotum below calypter haired. Abdomen ovate, third visible tergite with apical bristles, fourth without discals. Legs normal, mid-tibia with a strong submedian ventral bristle. Venation of wings as in *Phumosia*, the auxiliary vein setulose below close to humeral cross-vein, two or three setulæ at base of first vein below, third vein setulose above and below about midway to inner cross-vein.

Length 8·5 mm.

Type, Buea, Kamerun (*C. Bigge*). Hamburg State Zoological Museum.

Hemigymnochæta angola (Townsend).

Two males and two females, Uganda, Kampala, 20. i. 1928 (*H. Hargreaves*).

Tricyclea pallinervis, Curran.

Three males, five females, Kano, Nigeria, April 1928 (*V. Wigglesworth*).

Paratricyclea imitans, Villeneuve.

One female, Nyasaland, Maiwale, 22. x. 1928 (*Dr. W. A. Lamborn*).

Bengalia (*Ochromyia*) *depressa* (Walker).

One male, Nyasaland, Maiwale, 30. xii. 1928 (*Dr. W. A. Lamborn*).

Subfamily *RHINIINÆ*.

Tribe RHINIINI.

Genus IDIELLA, Brauer & Bergenstamm.

Idiella bipartita, sp. n.

Male.—Glossy black, with a slight greenish tinge on mesonotum and scutellum, and a purple tinge on abdomen. Antennæ and palpi black, bases of aristæ pale; posterior half of cheeks yellow-dusted and with golden-yellow hairs; postocular orbits grey-dusted. Mesonotum and scutellum densely black-dotted, a black dot at base of each hair and bristle; lower portion of apical edge of scutellum densely white-dusted; upper half of pleura, including entire mesopleura and upper edge of sternopleura, from anterior extremity to in front of posterior spiracle, yellow-dusted and with long golden-yellow hairs, sternopleural hairs pale but not so conspicuous as those above them. Abdomen without noticeable dusting or spots, the hairs on incurved lateral portions of first visible tergite and on second sternite yellow, the other hairs black. Legs black, basal segment of fore tarsi except its apex, and basal three segments of mid and hind tarsi, except narrowly at apices, yellow. Wings greyish hyaline, with a fuscous cloud at apex from above level of outer cross-vein to tip and extending to fourth vein, most distinct along the costa. Calyptræ golden-yellow at bases in line with the yellow pleural stripe, the remainder blackish. Halteres black.

Frons linear; ocellars short, inner verticals of moderate length, outer pair absent; eyes with transverse stripes in life, the upper facets slightly enlarged; facial carina evident between antennæ, about as wide as one antennal insertion, not sulcate; third antennal segment about three times as long as second; palpi much widened. Posthumeral bristle and presutural bristle present, weak, two closely placed pairs of prescutellar dorsocentrals, and one pair of prescutellar acrostichals present; mesopleura with the usual two upper hind-marginal bristles; sternopleurals 1 + 1. Hypopygium small, similar to that of *xanthogaster*, Wiedemann, in form. Legs normal; fore tarsi slightly widened; mid-tibia with one ventral, one anterodorsal, one posterodorsal, and two posteroventral bristles; hind femur with one strong preapical anteroventral bristle and about three weaker bristles on basal half of posteroventral surface; hind tibia with one anteroventral bristle, the anterodorsal surface without a well-developed fringe, a few setulæ in evidence beyond middle. First posterior cell of wing narrowly open.

Length 7 mm.

Type, N. Borneo, Bettotan, near Sandakan, August 2, 1927 (*Dr. C. Boden Kloss* and *H. M. Pendlebury*). Federated Malay States Museums. To be deposited later in British Museum, London.

This species will run into the section in my previously published key to the species of this genus which has the strong black bristles confined to the apical third of fore coxæ. It differs from any in that or either section in having the entire femora and tibiæ black, and the upper half of pleura densely golden-yellow dusted and haired and the lower half black.

Tribe COSMININI.

Genus BERIA, Robineau-Desvoidy.

I have before me a species which I consider is referable to this genus. In all available papers dealing with the genus there is no complete description of the thoracic chætotaxy, so that it is possible I am in error in my definition, but I consider the species now before me is entitled to generic separation from any included in my key to the genera of Rhiniinæ published in a previous paper in this series [*], with a strong probability that I am correct. In the key referred to the genus will run down in the tribe Cosminini to *Rhyncomyia*, Robineau-Desvoidy, from which it is readily distinguished by the lack of presutural acrostichals and the lobate lower calypter. Speiser in his report on the Diptera of Sjöstedt's Kilimandjaro Expedition, 1910, p. 151, gives a description of the genus and a species he accepts as the genotype, *inflata*, Robineau-Desvoidy. His description of the colours of the abdomen differs from that given by Robineau-Desvoidy, as he states that there is a blackish median vitta and the lateral margins are blackish, whereas Robineau-Desvoidy describes the abdomen as fulvous testaceous, with a broad greenish metallic line which covers almost all of the dorsum. Both descriptions agree in the colours of the legs, the femora black, and the tibiæ and tarsi yellow. Neither author mentions whether the eyes are bare or hairy.

It would appear possible that *Rhyncomyia dasyops*, Bezzi, must be closely similar to *inflata*, but in the species before me, which I consider is *tetropsis*, Bigot, there are no visible hairs on the eyes in either sex, and the legs are much more extensively fulvous-yellow.

I know that there is considerable variation in the colour-markings in the genus *Rhyncomyia*, the same species having or lacking a dark spot on the parafacial, or on the cheek, or on both. The species-key for *Rhyncomyia* and allied forms given by Bezzi [†] is for this reason not reliable for purposes of identification, too much dependence being placed upon the cephalic markings.

Beria tetropsis, Bigot.

One male and two females appear to belong to this species. The head is fulvous-yellow without black spots at bases of the frontal bristles and hairs in the female, the face may have a deep black spot near middle of each parafacial and a much paler and smaller mark on each cheek, or it may lack both (male). The thorax is black, with a greenish or bronzy lustre, the pleural hairs and some of those on lateral margins of mesonotum are pale, while those on disc of mesonotum are black; the scutellum in two of the specimens is concolorous with the mesonotum, while in one female it is noticeably testaceous centrally, the hairs on sides in both forms partly white and partly dark. Abdomen with three black vittæ on a fulvous ground, the laterals on lateral curve, in two specimens ceasing at fourth tergite, in the other carried partly over its disc. Legs, including coxæ and bases of mid and hind tarsi fulvous in two specimens, in the other with a dark streak on anterior side of hind femur. Wings yellowish hyaline, with a poorly defined but evident dark cloud on apical half costally.

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[*] Ann. & Mag. Nat. Hist. ser. 9, xviii. p. 496.

[†] Boll. Lab. Zool. gen. e. arrar., Portici, vol. vi. p. 69 (1911).

Structurally similar to *Cosmina*, but the head more swollen. Female with a number of short curved spines at apex of genitalia.

Length 10 mm.

Localities.—Male and female, Njala, Sierra Leone, the male at light, 11. iv. 1928, the female, on ground, 7. xii. 1927 (*E. Hargreaves*); female, Gold Coast, 1921–22 (*G. S. Cotterell*).

The last-mentioned specimen is the one with the dark stripe on the hind femur; it also has the third antennal segment longer than in the other two, and may possibly be distinct from them specifically, but more material is required to determine this.

Genus Cosmina, Robineau-Desvoidy.

In my paper in which I dealt with the tribe Cosminini I presented a synopsis of the species of *Cosmina*. In doing so I apparently confused two distinct species under the name *bicolor*, Walker. A long series of one of these recently received from Dr. Boden Kloss proves what I considered as merely variations within the species are actually specific characters. I append below a summary of the distinctions referred to. Both species will run out at *bicolor* in my key.

There are several specific names involved, including *bicolor*, Walker, *cuprina*, Bigot, and *pinangiana*, Bigot, according to Senior-White.

A. Propleura haired in centre, sometimes very indistinctly so in small examples; male with a single series of strong bristles close to apex of fifth visible tergite and a few much weaker setulose hairs anterior to them, visible extent of basal section of hypopygium about equal to length of fourth visible tergite at lateral curve; female genital segment without strong spines .... *bicolor*, Walker.

AA. Propleura bare in centre; male with several series of almost equally long bristles on entire exposed surface; basal section of hypopygium not as long as fourth visible tergite at lateral curve; female genitalia with three or more strong laterally directed curved spines on each side .... *confusa*, sp. n.

Cosmina confusa, sp. n.

Male and Female.—Similar in all respects to *bicolor*, Walker, except as noted in the above synopsis.

It may also be worth noting that the palpi are less noticeably yellow at bases, and the average length is less.

Length 5–6·5 mm.

Type, male, allotype, and 26 paratypes, Malay Peninsula, West Coast, Langkawi Island, April 14–May 2, 1928 (*H. M. Pendlebury*). Federated Malay States Museums. Type to be deposited in British Museum, London.

Family Tachinidæ.

Subfamily *DEXIINÆ*.

Genus BILLÆA, Robineau-Desvoidy.

I have carefully examined the genotype of this genus and that of *Gymnobasis*, Brauer & Bergenstamm, and *Gymnodexia*, Brauer & Bergenstamm, and consider that the three can very well be ranked as one genus. The vibrissæ are situated at various distances above the mouth-margin, highest in *Billæa*, where they are about as high above it as the length of second antennal segment, and lowest in *Gymnobasis*, where they are but slightly above the margin. It must also be noted that in *Gymnobasis* the facial carina is less strongly developed than in the other two, being well elevated and rounded only on the upper portion, while in the other two genotypes it is entire and more or less rounded to near mouth-margin. These notes are made from an examination of the genotypes in the United States National Museum, and it must be noted that they do not agree with the characters cited in Brauer's synopsis on pages 504–506 of his paper in 1893 [*], which apparently assign *Gymnobasis* to the group with well-developed carina, and *Gymnodexia* to the one with partial carina. He does not include *Billæa* in his key, but in the index it is placed as equivalent to *Sirostoma*, and on the bottom half of page 506 in the paper he gives a supplementary key in which he reduces the number of genera in the group to three, *Myiostoma*, Robineau-Desvoidy, sens. lat., *Sirostoma*, Rondani, sens. lat., and *Dexia*, sens. str. n., placing *Gymnobasis* and *Gymnodexia* as subgenera of the second of these. This would be almost in accord with my opinion, except that I am averse to ranking the segregates as even subgenera.

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[*] Verh. Zool.-Bot. Ges. vol. xliii.

The outstanding characters of the genus are as follows: Arista plumose; face more or less distinctly carinate; parafacials bare, eyes bare, much higher than cheek; proboscis short and stout; palpi well developed; no backwardly-directed upper orbital bristles in male; ocellars present; centre of propleura haired; prosternum bare; posterior sublateral bristle lacking; abdomen stout, without discal bristles on tergites 2 and 3. Habitus similar to that of most species of large size in the genus *Sturmia*, Robineau-Desvoidy.

I have before me one species from the Malay Peninsula, which I describe as new.

Billæa malayana, sp. n.

Male.—Head black, densely pale grey dusted except on interfrontalia, the latter deep black; basal two antennal segments testaceous-yellow, third entirely black; aristæ fuscous, yellow on basal halves; palpi fuscous, their apices brownish yellow. Thorax black, densely grey-dusted, mesonotum with four dark vittæ, the submedian pair almost indistinguishable except as two mere lines on anterior margin, the sublaterals more evident, but reduced to two elongated marks, one before, the other behind, suture; postalar callus and base of scutellum black, the former shining. Abdomen brownish testaceous basally, fuscous apically, the ground-colour obscured by the dense grey dust, apex of each tergite with a deep black fascia which is continued below, and slightly notched in centre, possibly sometimes interrupted there, and widest on each side of central notch. Legs black. Wings greyish hyaline. Calyptræ white. Halteres brown. All hairs except those on centre of occiput black.

Frons at vertex about one-fourth of the head-width, inner verticals strong, outer pair lacking, ocellars strong, divergent, orbits at middle about half as wide as interfrontalia, with an inner series of quite strong bristles, and laterad of these numerous fine hairs; antennæ extending to middle of face, third segment not twice as long as second, the latter with a fine bristle which is as long as antenna; arista as long as antenna, its longest hairs about as long as width of third antennal segment; facial carina in profile as high as width of parafacial and exceeding width of third antennal segment, evenly rounded at apex ; vibrissæ situated as far above mouth-margin as length of third antennal segment, separated by a distance a little greater than that of either from eye; cheek less than half the height of eye; palpi slender, slightly dilated at apices. Thorax with 3+3 dorsocentrals, 2+3 or 4 acrostichals, 1+1 sternopleurals, and the prealar short. Second visible tergite of abdomen with traces of a pair of apical median bristles, third with a complete apical series of bristles, fourth with a similar but weaker series and no discals; no ventral patches of hairs present. Mid-tibia with a submedian ventral bristle; hind tibia with the anterodorsal fringe quite regular and well developed, the posterodorsal surface with a similar but weaker fringe on the basal half terminated by a rather strong bristle; tarsal claws and pulvilli not elongated. Bend of fourth wing-vein with a short stump of a vein.

Length 12·5 mm.

Type, Malay Peninsula, Kedah Peak, 3950 feet, 25. iii. 1928 (*H. M. Pendlebury*). Federated Malay States Museums. To be deposited later in British Museum, London.

XXXV.—*A remarkable Speo-halophilous Water-strider* (*Heteroptera*, Mesoveliidæ). By Teiso Esaki, Entomological Laboratory, Kyushu Imperial University, Fukuoka.

A very remarkable type of aquatic Hemipteron was recently discovered by Prof. H. Yuasa of the Kyoto Imperial University in a cave on the shore of the Pacific coast of Japan. The habitat of this water-bug, *Speovelia maritima*, gen. et sp. n., is very peculiar, and, so far as I am aware, it is unique amongst the known insects. Through the courtesy of Prof. Yuasa, an ecological note of this insect is supplemented at the end of the present paper. I express herewith my best thanks to Prof. Yuasa who has generously forwarded me this valuable material for study, and has given a note completing thereby the present paper.

Although this insect is speo-halophilous and ecologically very different from its allies, it is morphologically little modified.

SPEOVELIA, gen. nov.

This genus is closely related to *Mesovelia*, Mulsant et Rey, but may be distinguished by the following characters :—

1. Head much larger, longer than thorax.

2. Eyes much reduced, much smaller, facets larger and conspicuously agglomerate.

3. Rostrum very long, reaching the posterior coxæ (only reaching the intermediate coxæ in *Mesovelia*).

4. Posterior margin of pronotum very convexly sinuate, making the pronotum longer than mesonotum (posterior margin of pronotum is straight and the pronotum much shorter than mesonotum in *Mesovelia*).

In *Phrynovelia*, Horváth, the only known genus of the family besides *Mesovelia*, the head is much longer than thorax, the eyes are very agglomerate, and the pronotum is the longest of the three thoracic segments. In these respects *Speovelia* has some affinities with *Phrynovelia*, but is different from the latter in other points. In *Speovelia* the body is much more oblong in shape, the eyes are much smaller and not touching the anterior margin of the pronotum, and the legs are very long and comparatively more slender than in *Phrynovelia*.

Description of the Genus.—Apterous form. Body spindle-shaped, males smaller but stouter than females. Head very long, conspicuously convex above. Vertex with two very thin, longitudinal sutures along the median line, which join each other at the base of vertex; sensory pits in three pairs, first pair situated near the anterior margin of vertex, second pair at two-thirds of the length of vertex from the posterior margin, third pair touching the posterior margin of the same, width between paired pits narrowest in the first pair, equal in the two posterior pairs. Eyes comparatively very small, not touching the anterior margin of pronotum, facets large, agglomerate. Antennæ four-segmented, very long and slender, antenniferous tubercles very conspicuous, first segment much the stoutest, slightly curved outwardly and thickest at the middle, second shortest, third and fourth very long and slender, more or less annulate, hirsute, fourth much the longest. Rostrum four-segmented (first segment invisible from outside), very long, reaching the middle of posterior coxæ, third (apparently the second) segment much the longest, very thickened near the base, fourth (the last) segment comparatively long, about one-third of the third in length. Dorsal surface of thorax trapezoid in shape, more or less concave at the middle, not constricted at the base of pronotum as in *Mesovelia*, sutures (segmentation) between thoracic tergites parallel, straight at the middle, forwardly curved at sides. Pronotum longest, a little shorter than meso- and metanotum together. Legs long and slender femora much stouter than tibiæ, tibiæ not longer (first two pairs) or longer (posterior pair) than femora, tarsi three-segmented, first segment much the shortest. Abdomen oblongo-elliptical, dorsal surface moderately convex, seven abdominal segments and a single genital segment are visible on dorsal surface in male, seven abdominal and two genital segments are visible on dorsal surface in female, six abdominal and two genital segments on ventral surface in both sexes. Connexiva very broad, a little obliquely erected. Macropterous form is unknown.

Type, *Speovelia maritima*, sp. n.

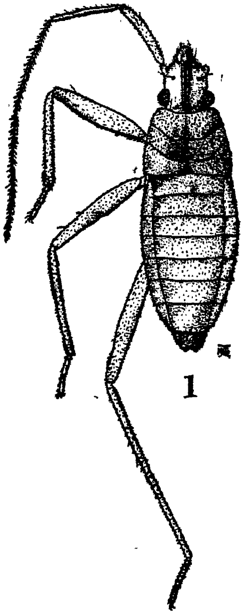
Distribution.—Japan. Found on the wet surface of caves on the sea-shore.

Speovelia maritima, sp. n. (Fig. 1.)

Apterous Form.—♂ ♀. Body sordid brown above, covered with pale brown shining pubescence above and beneath, dorsal surface not shining as in *Mesovelia* spp. Head sordid brown, anterior part of vertex, clypeus, and sides blackish brown, underside pale brown. Antennæ sordid brown, darker towards the apex. Eyes shining, dark brown in the middle, dark red in the peripheral area. Rostrum sordid brown. Thorax sordid brown above, pleural portions dark brown, sterna pale brown. Legs totally sordid greenish brown, slightly darker from the middle of femora to the apex of the legs, covered with minute pubescence. Abdomen sordid brown above, outer margin of connexiva dark brown. Under surface of abdomen dark brown, lateral area except the extreme margin much paler.

Body more or less elongate-oval. Head comparatively large, somewhat deflexed, longer than thorax (head : thorax =38:32). Vertex moderately convex, lateral margins parallel. Sensory pits in three pairs, first pair is very close to the anterior margin of vertex, second pair is found at about two-thirds of the length of vertex from the posterior margin, third pair is just on the posterior margin of the same. Eyes small, hemispherically produced laterally. Antenniferous tubercles very prominent. Antennæ very long and slender, first segment stoutest, slightly thickened at the middle, slightly curved outwardly; second nearly as long as but more slender than the first; third and fourth very long and slender, more or less annulate in structure, fourth much the longest. (Ratio of the antennal segments =36 : 35 : 50 : 68.) Rostrum very long, reaching the posterior coxæ, third segment very long, fourth comparatively long. (Ratio of the segments of rostrum, iii : iv=50 : 16.)

Dorsal surface of thorax trapezoidal, anterior margin slightly concavely sinuate, posterior margin straight, no constriction between pro- and mesonotum. Suture (segmentation) between pro- and mesonotum and the same between meso- and metanotum nearly parallel, much forwardly curved at the lateral portions. Sometimes a slight depression is present along the median longitudinal line. Pronotum much the longest of the thoracic tergites, a little shorter than meso- and metanotum together; mesonotum a little longer than metanotum. (Pro- : meso- : metanotum = 14 : 10 : 7.) Omphalium distinct, situated near the posterior margin of metasternum. Legs similar, but the anterior pair is stoutest and shortest, posterior pair longest and most slender. Coxæ very short, globosely rounded posteriorly, very setose near the joint with trochanter; trochanters very short; femora stout, stoutest near the base, then a little tapering towards the apex, with one or two spine-like hairs along the outer margin; tibiæ very slender, shorter or longer (see the table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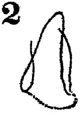
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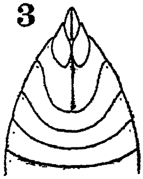
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Fig. 1.—Male.
Fig. 2.—Paramere.
Fig. 3.—Ventral view of the apical half of the abdomen in female.

below) than femora, with several spines along the outer margin of the posterior pair; tarsi three-segmented, short and slender, not longer than a half of tibia, first segment much the shortest, second shorter or longer (see the table below) than third, with two very distinct claws at the apex, without arolial structure.

Table showing the Relative Length of the Segments in Legs.

		Femur.	Tibia.	Tarsus i.	ii.	iii.
♂ :	Anterior leg	55	48	4	9	12
	Intermediate leg .	65	65	7	10	12
	Posterior leg	73	103	5	18	14
♀ :	Anterior leg	50	47	4	8	11
	Intermediate leg .	62	63	5	10	12
	Posterior leg	75	101	4	17	14

(44 units=1 mm.)

Abdomen oblongo-elliptical, lateral margins convexly rounded; tergites broad, lateral margins slightly convexly rounded, broadest at the fourth segment, first segment shorter than second, second to fifth segments subequal in length, sixth slightly longer than the preceding segment, seventh segment longer than the sixth, with the posterior margin convexly sinuate in female. Connexiva very broad, obliquely erect. Last three female ventral abdominal segments arcuately protruded anteriorly. First male genital segment much protruded posteriorly on dorsal side, making the second segment invisible from above, strongly concavely sinuate at the apex; truncate on ventral side, without a tuft of spines. Second male genital segment very short, much rounded posteriorly, invisible from above if not protruded; parameres symmetrical, very small, apparently folded transversely, moderately tapering towards the apex (fig. 2); ædeagus stout, a little tapering towards the apex, moderately curved upwards. First female genital segment apparently similar to an abdominal segment dorsally and extending laterally beneath the last segment of the connexiva; much projecting into the abdominal sternites on ventral side. Second dorsal segment represented by a disc-like tergite, ventral segment with a pair of strongly developed ovipositors inside (fig. 3).

Length of body, ♂ 3·5 mm., ♀ 4 mm.

Macropterous Form.—Unknown.

Habitat.—Japan.

Holotype ♂, allotopotype ♀, 19 paratopotypes (7 ♂♂, 12 ♀♀), Senjôjiki Grotto, near Seto, Province Kii, Central

Honshû, Japan, August 18, 1927, collected by Prof. H. Yuasa. Holotype, allotype, and 10 paratypes in my collection, other paratypes in the collection of Prof. Yuasa.

The species of the family Mesoveliidæ are generally found on the surface of stagnant water, especially on the floating leaves of such water-plants as *Nymphæa*, *Trapa*, and others. Some species are also found on hot springs, like *Mesovelia thermalis*, Horváth [*], and *Mesovelia orientalis*, Kirkaldy [†]. No species, however, has hitherto been found either in a cave, on the vertical surface of a wall, or on sea-water. Some characters of this new insect may be regarded as of adaptive significance to its peculiar habitat. The reduction of the eyes and of the pigment in their peripheral area can undoubtedly be regarded as an adaptation to life in a cave. The strongly developed pubescence of the body may be also an adaptation of a similar nature. The stongly developed ovipositors suggest that the eggs may be laid in some curious way. In any case, an effort to trace the life-history of this curious insect should be made in future, as it must be of extreme interest from the speobiological point of view.

XXXVI.—*An Ecological Note on* Speovelia maritima, *Esaki*

By Hachiro Yuasa, Entomological Laboratory, Kyoto Imperial University.

These interesting Mesoveliid bugs described by Professor Esaki were collected in a small littoral cave situated near the north-east end of the Senjojiki Promontory, noted for its gigantic rock-formation and for the spectacular displays of the mighty surf of the Pacific Ocean, about two miles to the south-west of the hot-spring sea-shore resort, Yuzaki of Wakayama prefecture. The cave is known in the vernacular as Komoriana, signifying the bat cave, and the abundance of bats roosting in it amply justifies this designation. I took a party of students from the marine biological station at Seto out to this cave on August 18, 1927, in order to examine its possible insect-fauna, as well as to catch bats and their insect-parasites for study.

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[*] This species was discovered by Horváth on the surface of Püspökfürdö (33°·7 C.), Transylvania, formerly in Hungary, now in the Rumanian territory, and described in Ann. Mus. Nation. Hungar. xiii. p. 547 (1915).

[†] This species is widely distributed over the Oriental region (East India, Ceylon, Sumatra, Java, Lombok, and Formosa), as well as in New Guinea, and was observed in Formosa on the surface of various hot springs (even 42° C.). See Esaki, Dôbutsugaku Zasshi, xxxiv. p. 32 (1922); Takahashi, *ibid.* xxxvi. p. 478 (1924), Taiwan Hakubutsugaku Kai Kaihô, xvi. pp. 97-98 (1926).

We found the cave to be about 4 metres wide and 7 metres high at low tide at its mouth, which opens directly west to the sea. A narrow channel, about 8 metres long, leads from the entrance to the middle section, where it was still light with the diffused sun-light, and roomy enough to swing freely an ordinary insect-net in all directions. The walls and the ceiling of this first half of the cave were dry, rather rugged and sharp-edged, and fairly free of growths of sea-weeds and halophilous algæ. Here we noted along the tide-marks typical, though scanty, littoral communities of mollusca etc. As to insects, none were fouud except for a few mosquitoes and unidentified flies on the wing.

From this point on, the cave takes a sharp turn toward the north and becomes gradually narrower and lower, until in the deepest end of the cave one has to crouch down in order to examine closely the walls of the interior. In this deep end of the cave, at least 10 metres away from the turn, the sun-light was found practically nil at 2.30 P.M., when the water was low and thus admitting supposedly the maximum amount of light through the mouth of the cave. The interior was quite cool, several degrees lower than the outside temperature, calm and undisturbed, while it was about 31° C. and breezy outside the cave. The entire surface of the inner half of the cave was quite moist, although no drippings from the seepage-water were noticed. It was coarse in texture, as might be expected from the nature of the rock, which is coarse sandstone of Tertiary formation and evenly concave, indicating that the cave is subject to the continuous action of the tide, and that it has not suffered from any fresh caving-in of rocks for some time either through the action of the waves or from water seeping through from above. Only a few oblique sutures intersect the walls, and there are no crevices or niches otherwise worth noticing. In fact, even the sutures themselves are so shallow and narrow that no rock-shelves are formed along them to afford hiding-places for the roosting bats or spaces for foothold for whatever sessile or inactive organisms that may inhabit the grotto. The floor of the first half of the inner section was smooth and rocky with shingles of various sizes, while the last half was covered with the usual beach-sand and when visited was exposed. The water inside the cave, especially in its interior, was a degree lower than that of the open shore, where the thermometer registered a temperature of 28° C. The extreme cleanliness of the inner half of the cave was most remarkable. The ceiling and the walls were practically free of any growths or accumulations, while the floor itself was devoid of any débris or drifts commonly found in such situations. Not a sign of droppings of bats was found, and this is all the more surprising since the bats were so numerous as to fly readily into our insect-nets and when excited even bump against our bodies. This absence of animal excreta and the physical conditions of the interior surface already described must be due to the tide filling in and washing out this part of the cave thoroughly every day. This daily rhythm must impose upon the speofauna certain ecological difficulties peculiar to this type of habitat.

We managed to capture in this cave twenty-six bats, which were kindly identified by Mr. Kishida as *Miniopterus schreibersii japoniæ*, Thomas. All of them harboured anything from two to eight Nycteribiid parasites of what I take to be *Penicillidia jenynsi*, Westwood, and another smaller species on their bodies and several mites on the webs of their wings. We made a thorough search for possible cave-insects and the following list includes all that were found. A number of mosquitoes and *Chironomus*-flies were captured on the wing or resting on the moist surface of the walls. There is nothing special about them either systematically or ecologically. An unidentified species of a cave-cricket, represented by twenty-two apterous nymphs varying from 5 to 13 mm. in body-length, was found singly on the walls of the inner section. They were fairly active and jumped off to the floor when pursued. The most important and interesting find was that of the new Mesoveliids. They were found in the deepest end of the cave resting quietly on the moist wall anywhere from 30 cm. to two metres high above the floor. None were found on the wet sand, on the surface of the water, or on the dry surfaces of the cave farther out. The bugs were slow of motion, and even when alarmed did not run fast. Their habitual inactivity and their dark brownish colour and small size tend to make the insects inconspicuous against the background of light brownish-grey sandstone. We managed to discover 21 adult specimens, including 8 males and 13 females and 5 last instar nymphs. A thorough search failed to reveal the younger nymphal stages. We tried to obtain some hints as to their feeding-habits, but we are as yet unable to find any clue on this point. At the time of capture they were always solitary, none mating, nor feeding, and in fact showed no special behaviour. The bugs appear to have a limited distribution, for, so far as we know at present, they are confined to this cave only. We examined on the same day another cave near by, and a little higher up on the rocky shore than the first one, and found it entirely uninhabited by this species. We found in the second cave, however, numerous bats, a large number of mosquitoes and a *Psychoda* fly on the wing or resting on more or less wet slimy walls, and several frogs on the wet muddy floor, which was in a chaotic condition on account of rocks having fallen from the roof only recently. The bugs are absent also from the numerous dry exposed caves on the rocky shores in the vicinity of the Marine Biological Station of the Kyoto Imperial University at Seto about five miles north-east of the bat-cave. In this connection it is interesting to note that Jeannel in his masterly 'Faune carvernicole de la France,' 1926, denied the existence of cave-inhabiting Mesoveliid bugs.

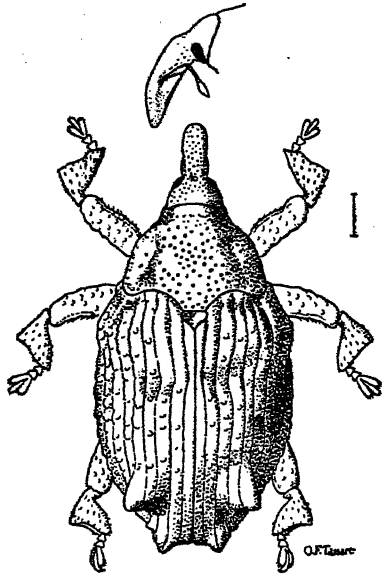
These *Speovelia* bugs, then, live sluggishly on the moist walls of a littoral cave, where light is totally absent, air practically saturated all the time, undisturbed and cooler than the outside temperature in summer, hence of very low or no evaporating power, and in loose association with a species of cave-cricket and bats besides mosquitoes and *Chironomus*. Aside from these fragmentary bits of information, we know nothing at present about the biology of this species. The ecological significance of the food-chains between the bats and their parasites on the one hand and of those between the mosquitoes and other small Diptera and the bats on the other is only too obvious, but what ecological niches in the sense of Elton in 'Animal Ecology,' 1927, the crickets and the *Speovelia* bugs may occupy remains to be elucidated. As pointed out by Professor Esaki, the species is remarkable in its habitat, and its ecology promises to be of great interest and well worth study.

XXXVII.—*Un nouveau genre remarquable de* Baridiinæ (*Coléoptères*, Curculionidæ). Par A. Hustache.

Fryella, gen. nov.

Tibias triangulaires, à peine plus longs que larges, à leur sommet profondément excavés, les tarses insérées à leur angle apical interne, au repos couchés dans la cavité du tibia, leurs articles glabres et brillants en dessus, le premier pyriforme, court, le deuxième à peine plus large et fortement transversal, le troisième grand, plus long que les deux premiers

réunis, spongieux, jaune-doré en dessous, ses lobes peu écartés, le quatrième robuste, assez long, ses angles petits et connés; fémurs sublinéaires, inermes, canaliculés en dessous. Mandibules excessivement courtes, peu visibles. Rostre creusé en dessous de deux sillons dans lesquels repose le funicule au repos, ces sillons étroitement séparés, réunis latéralement en arrière au scrobe, ce dernier court, oblique, logeant le scape. Antennes submédianes, courtes, glabres, le scape s'arrêtant loin de l'œil, claviforme, le funicule composé de sept articles très courts, très serrés, graduellement élargis, le premier peu plus long que large, la massue composée d'un seul article corné sur la face externe, tronqué très obliquement sur presque toute sa longueur sur l'interne, cette dernière plane et tomenteuse. Yeux allongés mais petits. Prosternum très légèrement impressioné, l'écartement des hanches un peu moindre que la hanche, le lobe postérieur assez grand et subtronqué au milieu. Episternes métathoraciques assez larges. Deux premiers segments ventraux soudés au milieu, ensemble plus du double aussi longs que les 3^e et 4^e réunis. Epimères mésothoraciques grands, leur bord postérieur en quart de cercle, leur sommet en angle presque droit. Pygidium vertical, découvert, en demi-cercle et grand.



Fryella quadrituberculata, sp. n.

Genre des plus singuliers qui se distingue aisément par la conformation des tibias, du rostre et des antennes.

Il ne comprend que l'espèce suivante :—

Fryella quadrituberculata, sp. n.

Ovale oblong, brun, la partie antérieure du corps et les pattes d'un roux-ferrugineux, mat, subglabre, les élytres avec quatre tubercules.

Rostre aussi long que la tête et le prothorax, épais, presque droit, renflé en dessous, ponctué subsillonné. Tête très courte.

Prothorax fortement transversal, subtrapézoidal, brièvement tubuleux en avant, la base très fortement bisinuée, son lobe médian large et tronqué, les côtés arqués; modérément convexe, marqué de deux impressions de chaque côté, sa ponctuation assez grosse mais irrégulière et peu profonde. Ecusson contigu aux élytres, grand, en ovale transversal, tronqué en avant, acuminé en arrière.

Elytres un tiers plus larges et plus du double aussi longs que le prothorax, modérément rétrécis en arrière et les côtés peu arqués, les épaules anguleuses, triangulaires, saillantes latéralement; disque déprimé et impressionné en avant; pourvus chacun de deux tubercules, l'un remarquablement gros, obtus, formant le calus postérieur, l'autre plus petit, mais fort, aigu, au sommet des trois premiers interstries; stries fines, ponctuées ; interstries alutacées et avec quelques granules râpeux.

Long. 4·5–5 mm.

Brésil : Rio de Janeiro (Coll. Fry) ; Sao Paulo (Coll. Bowring).

Type dans le British Museum.

XXXVIII.—*Five new Species of* Phycitinæ (*Lepidoptera*, Pyralidæ). By Sir G. F. Hampson, Bart.

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Asarta pyrenaica, sp. n.

♂. Head and thorax black-brown with some grey-white scales, the antennæ with tuft of whitish hair on basal joint, the palpi white below towards base and the proboscis whitish; abdomen black-brown with slight grey-white segmental lines; pectus, legs, and ventral surface of abdomen black-brown with some whitish scales, the fore legs and abdomen towards base with more white.

Fore wing very dark reddish brown thickly irrorated with grey-white scales except on basal half of inner area and terminal area; an indistinct grey-white medial line, angled inwards below the cell; two minute obscure dark discoidal spots; subterminal line grey-white with a black-brown mark before it on costa, slightly incurved at discal and submedian folds; cilia with fine whitish lines at base and middle and whitish tips. Hind wing very dark reddish brown; a creamy white streak below median nervure to just beyond the cell, slight streak above basal half of vein 2, and strong streak above basal half of vein 5; cilia black-brown at base, creamy white at tips. Underside of fore wing with the area below the cell and the postmedial area whitish; hind wing with whitish in, below, and beyond the cell.

FRANCE, E. Pyrenees, Vernet (*Walsingham*), 1 ♂ type. *Exp.* 20 mm.

Crocidomera ferrealis, sp. n.

♂. Head, thorax, and abdomen pale ferruginous red; legs grey-brown; shoulders and base of abdomen with fuscous patches. Fore wings greyish suffused with rufous and dark brown; the veins with dark streaks, especially from cell to postmedial line; antemedial line represented by obscure dark spots on costa, median nervure, and vein 1; a slightly redder mark in end of cell; postmedial line indistinct greyish, defined on inner side by some black on costa and the black streaks on the veins being more prominent, somewhat excurved at vein 5; a terminal series of black points; cilia pale rufous tipped with whitish. Hind wing semihyaline whitish; the veins, costal area, and termen tinged with brown; cilia with a dark brown line near base. ♀. Fore wing darker brown or more purplish red; hind wing wholly suffused with brown.

COSTA RICA, Sixola R. (*Schaus*), 1 ♀, Esperanza (*Schaus*), 1 ♀; TRINIDAD, Capara, 1 ♀; BR. GUIANA, Georgetown (*Bodkin*), 1 ♀; FR. GUIANA, Cayenne (*Schaus*), 1 ♂ type; BRAZIL, Amazons (*Austen*), Pará, 1 ♀, Brêves, 2 ♀, Paraña de Buyassu, 3 ♀. *Exp.* 29–36 mm.

Crocidomera cristalis, sp. n.

Head and thorax purplish grey mixed with fuscous; the crest on head pale yellow surrounded by rufous scales in male, flatter and all rufous in female; legs and abdomen fuscous and grey. Fore wing grey irrorated with rufous and dark brown; the veins streaked with rufous and dark brown; the inner area rufous and dark brown, expanding to cell at middle; the first line medial, very indistinct, angled outwards in and below cell, two obscure discoidal points; postmedial line only defined by the dark streaks on the veins being interrupted by whitish, curved; cilia purplish red with fine pale line at base. Hind wing hyaline white, the veins, costal area, and a fine terminal line brownish; cilia pale red with a darker line near base.

COSTA RICA, Juan Vinaz (*Schaus*), 1 ♀; VENEZUELA, Aroa; BR. GUIANA, Omai, 1 ♀ type, allotype ♂ in Coll. Schaus. *Exp.* 32–40 mm.

Crocidomera excisalis, sp. n.

Head, thorax, and abdomen purplish grey suffused with brown. Fore wing purplish grey irrorated with black, the terminal half of costa and terminal area below vein 5 suffused with rufous; the first line rather before middle and somewhat oblique, represented by a pair of slight black points on costa and prominent pairs of small black spots on median nervure and vein 1, with whitish marks between them; two black discoidal points; the veins beyond the cell streaked with black to the indistinct whitish postmedial line, which is oblique below vein 4; a terminal series of black points; cilia pale rufous. Hing wing semihyaline white; the costal area tinged with brown; a terminal brown line and fine line near base of cilia except towards tornus; in female almost wholly tinged with brown.

FR. GUIANA, Cayenne (*Schaus*), 1 ♂ type, allotype ♀ in Coll. Schaus; ECUADOR, R. Pastaza, R. Verde (*Palmer*), 1 ♂. *Exp.* 24 mm.

Crocidomera rubrizonalis, sp. n.

♂. Head, tegulæ, fore tibiæ, and tarsi pale rufous; thorax purplish grey; abdomen grey suffused with fuscous, the anal tuft pale. Fore wing pale purplish grey-brown with slight dark irroration; the first line medial, pale, straight, somewhat oblique, defined by rufous, and with rufous suffusion beyond it; a black discoidal lunule; the veins of terminal area with dark streaks; a fine dark terminal line; cilia pale rufous. Hind wing semihyaline white, the veins and costal area tinged with brown; a dark terminal line; cilia whitish with a fine brown line near base; the underside with the costal area suffused with brown.

FR. GUIANA, St. Jean Maroni (*Schaus*), 1 ♂ type, Cayenne. *Exp.* 30–32 mm.

XXXIX.—*Papers on Oriental* Carabidæ.—XXII.

By H. E. ANDREWES.

I HAVE lately been examining a collection of Carabidæ belonging to Mr. B. H. Klynstra of the Hague and containing material from the East Coast of Sumatra, collected by Mr. J. B. Corporaal, Mr. M. Knappert, and Dr. C. R. Pfister. Nearly all the genera and a good many of the species are already well known, but I am here describing two new genera, sixteen new species, and one new variety. I have found examples of some of these in other collections, and especially in that of the F.M.S. Museums. Mr. Klynstra, to whom I desire to express my cordial thanks, has allowed me to retain the type-specimens in my own collection, but in one instance a better example than his from the F.M.S. Museums has been made a type and placed in the British Museum.

Scarites sulcatus, Oliv., Ent. iii. 36, 1795, 7, t. i. f. 11; Chaud. Ann. Soc. Ent. Belg. 1880, 80.

Var. *sumatranus*, nov.

Length 30–34 mm.

In a note at the end of a long description of this species in his Monograph Chaudoir refers to two specimens from Java, smaller than the typical form, with the front sometimes more strongly striate, the prothorax narrower, and its front angles a little sharper. The five Sumatran specimens I have before me agree in the characters referred to with the Javan examples, and present also another one, not referred to by Chaudoir, namely, the reduction of the rugose apical region to a very small area round the apex.

Palembang, 1 ex., and Manna, 2 ex. (both *M. Knappert*). I have also two examples in my own collection (one of which I have made the type) labelled "Sumatra," but without locality.

Clivina integra, sp. n.

Length 4·5–5 mm.

Dark ferruginous, but occasionally much lighter.

Head with rather prominent eyes, median part of clypeus truncate, with a minute tooth at each extremity, wings small and rounded, placed well behind the median part and separated from it by a slight notch, frontal plates convex, rounded at sides, and separated from wings by an even smaller notch; surface of clypeus transversely depressed in front, raised behind, clypeal suture wanting, though sometimes visible at sides; frontal impressions deep and uneven, facial carinæ short but distinct, the sulci within them only moderately deep; neck-constriction deep at sides, shallow and sometimes obsolete at middle, crenulate, a small, often indistinct pore on vertex, surface generally smooth, but now and then uneven; labrum 7-setose, mandibles short and rather blunt, antennæ submoniliform, joint 2 evidently longer than 3. *Prothorax* convex, trapeziform, two-fifths wider than head, a sixth wider than long, narrowed in front, sides almost straight, hind angles dentate; median line and front transverse impression both moderately deep, a slight impression on each side of base, often continued forward on to disk in the form of a few fine punctures. *Elytra* moderately convex, hardly wider than prothorax, about four-fifths longer than wide; striæ fairly deep, faintly crenulate, 1 joining 2 at base, 3 and 4 free, 5, 6, and 7 joining near shoulder, striole slight; intervals convex, 3 with four pores adjoining stria 3, 8 narrow at extremities, though hardly carinate. Underside smooth, prosternal process moderately narrowed in front and slightly sulcate, both before and behind, venter with the apical pores on each side moderately distant. Profemora moderately dilated, protibiæ sulcate, with three digitations, mesotibiæ with a short stout spur near apex.

Extremely like *C. wallacei*, Putz., in appearance, but in that species the labrum is 6-setose. Resembling *C. helferi*, Putz., in the absence of any clypeal suture, but generally larger, wider, the prothorax usually, though not always, contracted in front, elytral striæ deeper and impunctate, underside smooth.

Medan, Bandar Baroe, and Sibolangit (all *J. B. Corporaal*); Manna (*M. Knappert*); Palembang (*M. Knappert*).

I have also seen specimens in various Museums, viz.:— Liangagas (Dohrn coll., Stettin Mus.); Tebing Tinggi (*Dr. Schultheiss*, Deutsch. Ent. Mus.); Medan, Tjinta Radja, and Kota Tjane (all *E. Mjöberg*, Stockholm Mus.); Kaju Tanam (*Dr. O. Beccari*, Genoa Mus.).

In the numerous specimens examined the labrum has proved to be 7-setose, but in one example from Palembang it is 6-setose, as in *C. wallacei*. This for the present I can only regard as a "sport," but if this character, so important elsewhere, should prove here not to have specific value, then all the above-mentioned examples may turn out to be *C. wallacei*, of which at present I have seen only four examples, all from New Guinea. Two of these, including the type, are in the Brussels Museum, and two, taken by Wallace at Dorey, are in the British Museum; these last two are larger and darker than the type, but in both of them the labrum is 6-setose.

Clivina spadix, sp. n.

Length 5·75 mm.

Castaneous. *Head* with the eyes moderately prominent, clypeus with median part and wings fused, the front margin undulating, the median part a little behind the rounded ends; frontal plates oblique, bordered, convex behind, separated from clypeus by a small notch; clypeal ridge cariniform, curved (convex forwards), a fairly deep depression behind it, clypeal suture obsolete, its site occupied by a number of pores of varying size; frontal impressions and facial sulci deep, facial carinæ strongly developed, produced into a small tooth on each side behind; a slight pore on vertex, neck-constriction rather narrow, punctate; labrum 7-setose, mandibles short but sharp, antennæ moniliform, joint 2 slightly longer than 3. *Prothorax* quadrate, as long as wide, sides faintly rounded, hind angles with a short tooth; median line fine, joining front transverse impression, which is impunctate, moderately deep, but does not quite reach margin at its extremities, surface with some vague transverse striæ. *Elytra* convex, slightly dilated behind, not quite twice as long as wide; striæ moderately impressed and finely punctate, 1 to 3 free at base, 4 to 6 joining behind shoulder, striole fairly long but very fine; intervals rather flat on disk, but moderately convex at sides, 3 with four pores adjoining striæ 3, 8 costate near apex. Proepisterna finely and closely striate-punctate, prosternal process sulcate, with a transverse sulcus behind it; metasternal process bordered. Venter very finely punctate at sides, the two marginal pores on each side of last segment distant from each other. Profemora not much dilated and not sulcate beneath; protibiæ deeply sulcate on upper surface; mesotibiæ with a strong spur close to apex.

Not far from *C. westwoodi*, Putz., but the clypeal ridge is cariniform, the prothoracic transverse sulcus does not reach margin, and stria 4 of the elytra, instead of being free at base, joins 5 and 6.

Bandar Baroe (*J. B. Corporaal*), 1 ex.

Tachys incilis, sp. n.

Length 2·4 mm.

Black above, piceous beneath, apex of venter reddish; palpi and joints 1 to 3 of antennæ more or less ferruginous, legs flavous, rest of antennæ fuscous.

Head with duplicated, somewhat irregular furrows, eyes moderately prominent, mentum without pores, joint 3 of antennæ hardly longer than 2. *Prothorax* convex, evidently wider than head, a third wider than long, base and apex equally wide, sides strongly rounded, sinuate quite close to base, hind angles in the form of a rectangular tooth, furnished with a well marked carina; basal sulcus deep, very finely crenulate, interrupted and with a pore at middle. *Elytra* moderately convex, the border smooth, rounded at shoulder; two slightly curved, crenulate dorsal striæ, fairly deep and not ending abruptly, 1 reaching apex, but not quite reaching base, 2 extending well beyond the dorsal pores, 3 invisible, 8 deep throughout, striole curved, a little nearer margin than suture, the pore about halfway along it, dorsal pores distinct, at a fourth and a half, on site of stria 3. No microsculpture on head or prothorax, and only vague traces on head. Metasternal process with an arcuate groove at a little distance from front extremity.

Near *T. politus*, Motch., but smaller in size and black on upper surface. The sculpturing generally is not so strong, the crenulation of the basal sulcus of prothorax slighter, that of the elytral striæ more evident.

Medan (*J. B. Corporaal*), 1 ex.

Tachys eurynotus, sp. n.

Length 1·7–2·2 mm.

Ferruginous, suture and underside a little darker: joint 1 of antennæ and legs flavous.

Head wide, frontal impressions linear, rather shallow, diverging a little behind, eyes not prominent, mentum without pores, antennæ submoniliform, joint 2=3. *Prothorax* convex, a half wider than head and fully two-thirds wider than long, base truncate, much wider than apex, sides rounded in front, not contracted behind, but continued perpendicularly to base, with only a trace of sinuation, hind angles right and moderately sharp, without any appreciable carina; basal sulcus rather shallow, smooth, with two small pores at middle. *Elytra* convex, a half wider than prothorax, but only a fourth longer than wide, border smooth, just rounding shoulder; stria 1 fairly deep, reaching apex, but not quite reaching base, 2 to 4 faintly impressed and subcrenulate, but quite distinct when viewed from the side, 5 and 6 just traceable, 8 deeply impressed near apex, striole short but deep, on middle of elytron, with a large pore at middle, a single minute dorsal pore rather behind middle, on the interval. No microsculpture. Metasternal process with a deep curved groove behind it. Claws denticulate.

Very near *T. striatulus*, Andr., but shorter and wider, and without any suggestion of a dark patch towards apex of elytra. The sides of the prothorax are not contracted behind, striæ 2 to 5 are more clearly visible and even 6 can be detected, but not 7.

Palembang, 2 ex., and Manna, 2 ex. (all *M. Knappert*).

RHYSOPUS, gen. nov.

Body glabrous, winged.

Head wide, convex, with a single large supraorbital pore on each side, clypeal suture deep, continued obliquely on each side to eye; eyes separated from buccal fissure; labrum emarginate, 6-setose; mandibles short but strong, blunt and almost truncate at apex, a slight blunt tooth at about middle, somewhat hollowed out inwardly, no seta in the scrobe; mentum with a seta at each side of base, lobes rounded externally, pointed at apex, epilobes developed and extending a little beyond lobes, sinus fairly deep, edentate; ligula moderately wide, dilated and truncate in front, bisetose; paraglossæ membranous, a little longer than and nearly as wide as ligula, glabrous, adnate to a third from apex and then separated from ligula on each side by a fairly wide emargination; maxillæ sharp, hooked, furnished inwardly with comparatively few bristles; palpi with the two apical joints about equal, joint 2 of labials inwardly plurisetose, apical joint in both maxillaries and labials setulose, subacuminate but truncate at extremity; antennæ short, pubescent from about middle of joint 3. *Prothorax* convex, rounded at sides, a single marginal seta on each side rather before middle. *Elytra* 9-striate, a fairly long scutellary striole between striæ 1 and 2, base bordered. Prosternal process unbordered, slightly setose; ventral segments with a single seta on each side, apical segment (♂ ♀) with two setæ on each side. Legs short and stout, metafemora with the hind margin bisetose; protibiæ with the fixed inner spur tridentate; tarsal joints short, glabrous (though under the microscope a few minute hairs are visible), 4 emarginate; in the metatarsi 1=2+3; in the protarsi and mesotarsi ♂ the four basal joints are dilated, the first narrowly, the other three widely. The underside of the dilated joints is furnished with about 12–15 fine longitudinal ridges, and twice as many scales, transversely placed between each two adjacent ridges.

The unusual characters of the ♂ protarsi differentiate this from any other Harpaline genus known to me. In a good many of its characters it appears to approach the Chinese *Amaroschesis*, Tchitch., but in that genus the mentum is toothed and the ♂ protarsi appear to be of the normal Harpaline character.

Rhysopus klynstrai, sp. n.

Length 11–12 mm.

Black, shiny, very faintly iridescent: femora flavous, antennæ, palpi, tibiæ, and tarsi more or less ferruginous.

Head more or less contracted behind, the genæ evident, oblique, a slight depression on each side of front, adjoining the oblique part of clypeal suture, antennæ reaching base of prothorax. *Prothorax* a third wider than head and as much wider than long, widest just before middle, base truncate, narrowly bordered, except at middle, apex moderately emarginate, narrowly bordered, front angles evident but rounded, sides well rounded, a little explanate, narrowly bordered, no sinuation behind, hind angles evident but rounded; median line fine, a little deeper towards base, front transverse impression distinct at middle only, hind one vague, basal foveæ wide, fairly deep, finely, closely, and confluently punctate, middle of base and explanate margins finely and rather closely punctate, surface otherwise smooth. *Elytra* subquadrate, with square shoulders, a fourth wider than prothorax and about a half longer than wide, widest a little behind middle, sides very gently rounded, rather strongly sinuate (♂ ♀) before apex; striæ deep, impunctate, intervals convex, 3 with a small pore at a fifth from apex, adjoining stria 2, marginal series subinterrupted at middle, wide and irregular at apex. Microsculpture of elytra formed by extremely fine transverse lines; on the prothorax these lines are rather more visible and form very wide meshes; the head is smooth. Episterna and sides of metasternum finely punctate; metepisterna contracted behind, nearly twice as long as wide.

I know of no near ally, but possibly some of the species of the genus *Amaroschesis*, unknown to me in nature, may prove to be of somewhat similar appearance.

Palembang (*M. Knappert*), 6 ex. JAVA: Buitenzorg (Buitenzorg Mus.), 1 ex., and a second specimen labelled "Java" only, which has been in my collection for many years. TONKIN: Hoabinh (*R. Vitalis de Salvaza*), 2 ex.

Lamprophonus circumtinctus, sp. n.

Length 7–8 mm.

Piceous: upper surface æneous, palpi, antennæ, legs, and margin of prothorax and elytra, the former narrowly, the latter narrowly near base, more widely at apex, ferruginous.

The epipleura of prothorax and elytra, the middle of prosternum, and the sides of venter are also flavous or ferruginous.

Head convex, frontal impressions short, wide, and tolerably deep, continued obliquely on each side as a fine line to eye, clypeal suture rather fine at middle, somewhat deeper at sides, eyes large and prominent, antennæ reaching basal fourth of elytra, surface finely, closely, but rather vaguely punctate. *Prothorax* nearly flat, cordate, a fourth wider than head, two-thirds wider than long, base with its sides somewhat oblique, a little wider than apex, which is slightly emarginate, sides narrowly bordered, moderately rounded in front, very faintly sinuate behind, the seta at apical third, hind angles a little obtuse and not very sharp; median line fine and very short, connecting the two transverse impressions, both of which are distant from margin, the front one moderately deep, the hind one visible only at middle, basal foveæ long, wide, and shallow, surface finely and closely punctate, more finely on disk, more coarsely at sides of base. *Elytra* only moderately convex, the base slightly emarginate, the shoulders well marked, not quite a half wider than prothorax and as much longer than wide, very slightly dilated behind, the margin distinctly sinuate before apex; striæ moderately impressed, impunctate, deeper close to apex; intervals nearly flat on disk, convex near apex, 3 with a pore at apical third, adjoining stria 3, marginal series uninterrupted, conspicuous towards apex, surface finely and fairly closely punctate. The microsculpture of the elytra consists of very fine irregular transverse lines; on the prothorax are vague transverse meshes and on the head even vaguer isodiametric meshes. Underside smooth, metepisterna strongly contracted behind, much longer than wide.

Very much like *L. marginalis*, Walk., in size, shape, and colour, though with a much narrower pale border on both prothorax and elytra. The prothorax is much wider, the basal foveæ more evident, the puncturation a little coarser; the elytral striæ are deeper, the intervals not quite flat, the puncturation less close. The microsculpture is similar, whereas in the third species, *L. lucens*, Bates, there is a reticulation of isodiametric meshes on the elytra; this last is a larger, commoner, and much more widely spread species.

Bindjei (*Dr. C. R. Pfister*), 2 ex., ♀ ♀.

Patellus florens, sp. n.

Length 3·75–4·25 mm.

Black, shiny, with a trace of iridescence: palpi, joints 1 and 2 of antennæ, apex of elytra, and apical part of venter ferruginous ; rest of antennæ, and sometimes median parts of femora and tibiæ brownish.

Head small, convex, frontal foveæ short and narrow, but fairly deep, diverging behind, a slight rounded impression on middle of front between them, eyes moderately flat, antennæ slender, reaching a little beyond base of elytra. *Prothorax* convex, two-thirds wider than head, one-third wider than long, base bisinuate, wider than apex, which is finely bordered, front angles evident, only slightly rounded, sides extremely finely bordered, moderately rounded from apex to base, a large pore at middle, none behind, hind angles slightly obtuse, not rounded ; median line fine, transverse impressions obsolete, basal foveæ wide and shallow, surface smooth. *Elytra* convex, a fourth wider than prothorax, a half longer than wide, base bordered, shoulders evident though rounded, sides parallel, faintly sinuate near apex; 7 dorsal striæ, 8 and 9 merged in the marginal channel, striæ moderately impressed and finely punctate, none reaching base, 2 and 7 commencing further from it than the others, no scutellary striole, but an umbilicate pore on each side close to base opposite stria 2; intervals slightly convex on disk, more so at sides and apex, about equal in width, 3 without pores. The microsculpture of prothorax and elytra consists of extremely fine transverse lines, which hardly form meshes ; on the front of head it consists of irregular meshes, which on the whole are rather wider than long.

I have known examples of this species for a long time, and have hitherto considered them as not more than a variety of *P. drimostomoides*, Chaud. On examining a large number of specimens I find that certain differences noticed before are constant, and I think it better, therefore, to treat the Malayan form as a distinct species. It is a little smaller in size and darker in colour, both prothorax and elytra being a little narrower, the lateral border of the former evidently finer. The form of the elytra is less ovate, the sides being parallel for some distance in the middle, and both striæ and the punctures in them less impressed, especially at the sides. The microsculpture of the two species is similar. Chaudoir included the genus in his "Monographie des Oodides," though with some hesitation, but it seems better placed among the Pterostichini in the neighbourhood of *Cælostomus*.

Bindjei (*C. R. Pfister*), 2 ex., Medan (*J. B. Corporaal*), 8 ex. ; Bekassa, Deli-Sumatra (*J. B. Corporaal*—Zoological Mus. Amsterdam), 2 ex.; Tjinta-Radja and Medan (*E.*

Mjöberg—Stockholm Museum), numerous examples. In the collection of the Buitenzorg Museum, Java, I saw examples from Krakatau and Verlaten Island.

Colpodes klynstrai, sp. n.

Length 8·5–9·0 mm.

Piceous: head black, prothorax (above and beneath) red to flavous, elytra purplish blue; apex of palpi, last few joints and extremities of joints 1 to 4 of antennæ, trochanters, and tarsi more or less ferruginous.

Head small, convex, smooth, with a slight neck constriction, frontal foveæ shallow, diverging behind, a shallow rounded impression on each side of front behind, eyes large and prominent, genæ inconspicuous, antennæ filiform, reaching basal fourth of elytra. *Prothorax* small, convex, slightly wider than head and a little wider than long, base with its sides somewhat oblique, rather wider than apex, which is a little emarginate, sides finely bordered and somewhat explanate, reflexed behind, gently rounded in front and faintly sinuate before hind angles, which are slightly obtuse though not rounded, a seta just before the middle and on the angle; median line and front transverse impression both faint, hind impression fairly deep, basal foveæ small but deep, bounded outwardly on each side by an oblique carina, surface smooth, basal area a little uneven. *Elytra* moderately convex, ovate, with evident, though rounded shoulders, not quite twice as wide as prothorax, or twice as long as wide, the apices separately rounded, with a re-entrant angle between them, a fairly deep sinuation just in front on each side; finely punctate-striate, the striæ deeper close to apex, 8 deep throughout; intervals flat, 3 with three pores, first at a fourth, adjoining stria 3, second and third at three-fifths and five-sixths respectively, adjoining stria 2; surface smooth, with a deep depression on each side just before middle, covering intervals 3 to 6. Microsculpture of elytra consisting of very fine transverse lines, sometimes forming very wide meshes, almost invisible on prothorax, the meshes isodiametric, but very faint on head. Underside smooth, metepisterna twice as long as wide, last ventral segment ♂ with one seta, ♀ with two setæ on each side. Protibiæ not outwardly sulcate, meso- and metatarsal joints (joint 1 only in protarsi) bisulcate, joint 4 moderately bilobed, inner lobe longer in protarsi, outer one in meso- and metatarsi, joint 5 not ciliate.

Closely allied to *C. chloropterus*, Chaud., but rather larger, the elytra more brightly coloured, the legs piceous. The prothorax is a little narrower, and the basal foveæ are bounded outwardly by a slight, though evident carina (quite absent in *chloropterus*); the elytra are similar in form, but the striæ—especially the outer ones—are much finer, as is the microsculpture.

Palembang and Manna (*M. Knappert*), 10 ex.

Odacantha cribricollis, sp. n.

Length 6–8 mm.

Black: palpi, joints 1 to 4 of antennæ (but the joints of the palpi and joint 1 of the antennæ are dark at base), and legs more or less ferruginous; elytra with a small, elongate, white spot on intervals 4 and 5, sometimes extending to 6 (very faint in type).

Head convex, shiny, impunctate both above and beneath, contracted behind into a narrow condyliform neck, genæ slightly convex, as long as eyes, frontal foveæ deep, uneven, extending in front on to the clypeus, interrupted on each side behind by an oblique ridge, a shallow rounded impression on middle of front, continued backwards to mid-eye level as a shallow furrow, eyes large and prominent, antennæ slender, just reaching elytra. *Prothorax* subcylindrical, evidently narrower than head and about twice as long as wide, widest rather behind middle, constricted in front of base, a shallow punctate furrow along each side, surface a little dull, densely, coarsely, and confluently punctate, a little less densely on underside. *Elytra* moderately convex, two and a half times wider than prothorax, not quite twice as long as wide; shoulders evident but oblique, sides a little constricted at a third from base, apex bi-emarginate, a sharp tooth on each side at the outer angle of the emargination; striæ moderately deep and very coarsely punctate, intervals convex, 3 with three setiferous pores (in one specimen apparently four), which are difficult to see owing to the coarseness of the punctures in the striæ. A well marked microsculpture of isodiametric meshes is visible on the elytra, but not on the head or prothorax.

In the very coarse puncturation of the prothorax this species resembles *O. litura*, Schm.-Goeb., but in size and form it is more like *O. distigma*, Chaud. The rough sculpture of both the prothorax and elytral striæ is alone sufficient to distinguish the insect from any other Oriental species yet described.

Medan (*J. B. Corporaal*), 1 ex. I have seen two other examples from the same locality, one taken by Mr. E. Mjöberg and now in the Stockholm Museum, and another taken by Dr. E. Fulmek and now in Mr. M. Liebke's collection.

Planetes pendleburyi, sp. n.

Length 9–10 mm. (excluding abdomen). Body shortly pubescent.

Black: underside piceous and slightly iridescent; buccal organs, antennæ, legs, and a more or less rounded spot on each elytron, placed just before middle and covering about four intervals, ferruginous to flavous, apical joints of antennæ sometimes darker.

Head shiny, with short, wide, shallow frontal impressions, eyes moderately prominent, antennæ thick, neck somewhat constricted, middle of front smooth, rest of surface punctate, rather coarsely at sides behind. *Prothorax* subcordate, about a fourth wider than head and as much wider than long, equally contracted at extremities, widest at apical third, sides of base oblique, sides rounded in front, then straight to hind angles, sometimes faintly sinuate, hind angles obtuse but with a minute sharp tooth; median line shallow, basal foveæ moderately deep, the whole surface nearly uniformly and fairly densely punctate, a little more finely and less densely on disk. *Elytra* rather flat, with nearly parallel sides, a fourth wider than prothorax and three-fourths longer than wide, base somewhat emarginate, apex truncate; primary costæ conspicuous, much wider than the secondary ones, which form very fine carinæ, the rows of punctures microscopic. Underside punctate, prosternum nearly smooth, sides of metasternum with coarse punctures, venter with fine transverse punctures.

Smaller than *P. bimaculatus*, Macl., the prothorax much more coarsely punctate. Very nearly allied to *P. muiri*, Andr., from Macao, but the eyes more prominent, the prothorax with its sides straight or even sinuate behind, its surface a little less coarsely punctate, the elytral spot larger, the primary costæ wider and more evident. In describing *P. muiri* (Ann. & Mag. Nat. Hist. (9) xiii. 1924, p. 471) I said that the eyes were pubescent; this is inaccurate, the orbits being pubescent, but the eyes themselves glabrous.

Balighe (*E. Modigliani*—Genoa Mus.), 1 ex.; Palembang (*M. Knappert*), 1 ex.; I have also seen two examples from Singapore (*C. J. Saunders* and *H. C. Abraham*), and one from Kuala Lumpur (F.M.S. Museum). Type in the British Museum.

Dolichoctis opima, sp. n.

Length 4·5 mm.

Piceous: disk and underside of prothorax, venter, and outer side of tibiæ dark ferruginous; buccal organs, antennæ, side-margins of prothorax, and legs light ferruginous; a vague shoulder and apical spot on each elytron, indistinctly joined along intervals 7 and 8, dull red.

Head small, convex, frontal foveæ very slight, eyes fairly prominent, a slight sulcus on each side along their inner margin, antennæ reaching base of prothorax, surface minutely punctate and faintly obliquely striate. *Prothorax* convex, nearly a half wider than head and as much wider than long, base truncate, its sides somewhat oblique, wider than apex, which is rather deeply emarginate, sides rounded in front, straight behind, moderately explanate and a little reflexed, front angles evident but rounded, hind angles obtuse and a little rounded, front lateral pore apparently missing, the hind one on the angle; median line moderately deep, deeper behind, front transverse impression fine and shallow, hind one deep and wide, basal foveæ rather small but deep, disk with a few minute punctures, margins sparsely and more coarsely punctate. *Elytra* very convex, three-fourths wider than prothorax and a fourth longer than wide, shoulders well marked, sides rounded, apex obliquely truncate, but not emarginate; punctate-striate, with a short deep scutellary striole, the striæ deep (for the genus), deeper at sides, where also the punctures are more evident; intervals more convex at sides than on disk, 3 with two minute pores, one just behind middle and the other at three-fourths, but these are difficult to distinguish because there is an irregular row of minute pores along each interval. Microsculpture of elytra formed by very fine transverse lines, which hardly form meshes; prothorax smooth; head with scarcely visible isodiametric meshes.

Though I know of other undescribed Malay species, which are equally convex and similarly striate, I know of none described to which this can be usefully compared.

Sibolangit (*J. B. Corporaal*), 1 ex.

Dolichoctis elegans, sp. n.

Length 4 mm.

Black: palpi, joints 1 to 4 of antennæ (rest somewhat darker), two large, irregularly-rounded spots on each elytron, the front one from stria 2 to 8, the hind one from stria 1 to 8, and legs ferruginous, but the basal two-thirds of the femora and a wide ring round the tibiæ are piceous.

Head small, convex, frontal foveæ short but fairly deep, eyes moderately prominent, antennæ barely reaching base of prothorax, surface a little dull, with some minute punctures.

Prothorax convex, subcordate, a fourth wider than head and a third wider than long, base truncate, its sides slightly oblique, apex bordered, moderately emarginate, a little narrower than base, sides with a fine reflexed border, gently rounded in front and faintly sinuate behind, no seta in front, but one on the hind angle, which is reflexed, obtuse, and hardly rounded ; median line and transverse impressions all fairly deep, basal foveæ very deep, converging forwards for a short distance, then diverging and continued on each side to the middle of half-disk, a slightly raised area within each hind angle, surface shiny and smooth, some very faint indications of punctures in the foveæ and lateral channels. *Elytra* convex, nearly twice as wide as prothorax, and two-fifths longer than wide, shoulders evident, sides strongly rounded, apical truncature rather vaguely indicated, a small re-entrant angle at apex; striæ fairly deep, practically impunctate, scutellary striole very short ; intervals moderately convex, 3 with three clearly marked pores, adjoining stria 3, near base, just before middle, and not far from apex. Microsculpture of elytra consisting of fine transverse lines, which form very wide meshes ; prothorax smooth; head with rather coarse, somewhat irregular, isodiametric meshes.

Apparently allied to *D. angulicollis*, Chaud., but larger, the prothorax wider, with rounded sides and a smooth surface, elytra with strongly rounded sides and impunctate striæ.

Sibolangit (*J. B. Corporaal*), 1 ex.

Risophilus vittiger, sp. n.

Length 4·5–5 mm.

Testaceous : head and prothorax dark ferruginous, lateral borders of prothorax and a median vitta on the elytra, just failing to reach either base or apex, and covering about one and a half intervals, piceous.

Head convex, smooth, constricted behind, genæ contracted gradually to neck, frontal foveæ rather short and narrow, a slight depression on each side of vertex, eyes moderately prominent, antennæ reaching basal sixth of elytra. *Prothorax* convex, as wide at base as the head and as long as wide, base with its sides very oblique, directed forwards, wider than apex, sides bisetose, with a narrow reflexed border, very slightly rounded from apex to near base, then turning sharply outwards, the hind angles projecting laterally on each side as a rectangular reflexed tooth ; median line and transverse impressions all shallow, basal foveæ short, oblique, linear, and almost in the angles, surface rather faintly transversely strigose. *Elytra* moderately convex, two and a half times as wide as prothorax, three-fifths longer than wide, shoulders evident, sides nearly parallel, but widest at apical third, apex rather sharply truncated, the outer angle on each side rounded; striæ moderately deep and only microscopically crenulate, 1 deeper than the rest, intervals moderately convex, 3 with three conspicuous pores, near base, at a third, and at five-sixths respectively, all adjoining stria 3. Microsculpture evident, the meshes isodiametric on head and elytra, slightly transverse on prothorax. Venter setulose on each side of median line.

Larger than *R. suturalis*, Schm. Goeb., the dark elytral stripe without any cross-piece behind. The prothorax is longer, with less rounded sides and less acute hind angles; the elytra are more deeply striate and with three instead of two setiferous pores on the third interval.

Bandar Baroe (*J. B. Corporaal*), 6 ex.; Lau Rakit (*J. B. Corporaal*—Zoological Mus. Amsterdam), 1 ex.

Risophilus inornatus, sp. n.

Length 4·5 mm.

Testaceous: head and prothorax dark ferruginous, lateral borders of prothorax piceous.

Head convex, smooth, neck slightly constricted, genæ contracting gradually to neck, frontal foveæ slight, a faintly depressed area on each side near eye, eyes not prominent, antennæ reaching basal sixth of elytra. *Prothorax* convex, cordate, slightly narrower than head, a very little longer than wide, base arcuate, its sides oblique, directed rather strongly forward, wider than apex, sides with a narrow reflexed border, bisetose, the front pore large, on the border, where it almost forms an angle, moderately rounded in front, then turning sharply outwards, the hind angles projecting laterally on each side as a reflexed rectangular tooth; median line moderately impressed, rather deeper in front and behind, transverse impressions very slight, basal foveæ small, but fairly deep, rounded and within the angles, surface here and there transversely strigose, slightly depressed on disk (but this is possibly accidental). *Elytra* moderately convex, two and a quarter times as wide as prothorax, rather less than two-thirds longer than wide, shoulders evident, rather dilated behind and widest at apical third, rather sharply truncated, the truncature on each side a little emarginate, outer angle rounded, inner one sharp; striæ rather lightly impressed and very vaguely crenulate, 1 hardly deeper than the rest, intervals slightly convex, 3 with two pores, at about basal fifth and near apex, front one practically on stria 3, hind one on the interval. Microsculpture conspicuous, the meshes isodiametric, but on the disk of the prothorax they are about twice as wide as long.

Near *R. cordicollis*, Bates, from Annam, but a little smaller and paler. In Bates's species the head is without microsculpture, the prothorax has the various impressions more clearly defined, the hind angles are obtuse, though sharp, and do not project very far laterally, the elytra are longer and less dilated behind.

Bandar Baroe (*J. B. Corporaal*), 1 ex.

ÆOLODERMUS, gen. nov.

Body winged, glabrous.

Head rather long, eyes moderately prominent, with two supraorbital pores and setæ, the hind one far distant from eye; clypeus bisetose, the suture very fine; labrum transverse, 6-setose, the setæ increasing in length from within outwards; mandibles hooked, very sharp at extremity, without seta in the scrobe; mentum widely and deeply emarginate, edentate, lobes oblique at sides, rounded at the apex; ligula dilated at apex, truncate, quadrisetose, paraglossæ membranous, fairly wide, adnate, extending some little distance in advance of ligula; maxillæ slender, slightly hooked, inwardly furnished with short bristles, not reaching apex, outer lobe unjointed; maxillary palpi long, joints 2 and 3 equal, 4 rather shorter, setose, pointed at apex; labials shorter, 2 very slender, bisetose, 3 a little shorter than 2, setose, pointed at apex; antennæ long and slender, 2 very short, 1 stout, as long as 3, the other joints slightly longer. *Prothorax* cordate, the sides bordered, strongly rounded in front, with a pore and seta at the widest point, even more strongly contracted behind, so that the base appears produced and is hardly more than half as wide as apex, the surface densely and irregularly striate. *Elytra* rather flat, nearly oval, truncate and bi-emarginate at apex, 9-striate, but striæ 8 and 9 lie together in the marginal channel and are hardly distinguishable, the pores of the marginal series large, surface chequered and highly sericeous, as in *Æphnidius adelioides*, Macl. Underside smooth, ventral segments with a single seta on each side, apical segment ♂ with the setæ a little removed from margin, ♀ with two setæ on each side, also removed from margin, which is excised at middle. Legs, and especially tarsi, very slender, protarsi ♂ with three basal joints slightly dilated and clothed beneath with large white scales, upper surface of tarsi setulose.

Genotype, *Homethes* (*Homothes*) *emarginatus*, Chaud. (Bull. Mosc. 1872, i. p. 389). The type, which I have not seen, was said to come from Melbourne, and the author's description of the species is a long and detailed one; in regard to the locality I think a mistake has occurred, and that the specimen probably came from the Malay region. Mr. T. G. Sloane informed me some years ago that he had identified the species in an insect from Celebes, and he subsequently sent me another specimen found in Borneo; this I found to agree exceedingly well with Chaudoir's description.

In Mr. Klynstra's collection there were two examples from Medan (*J. B. Corporaal*), and I have also seen three examples in the collection of the Stockholm Museum from the same place (*E. Mjöberg*). In my collection I have a specimen taken many years ago in the Malay Peninsula by Dr. M. Cameron, who kindly gave it to me, and another example, now in the F.M.S. Museum, was taken at light by Mr. H. M. Pendlebury in 1928.

The new genus is nearly allied to *Homethes*, Newm., from which it differs in the form of the prothorax, the truncature of the elytra, the character of the upper surface, and the pubescence both of the palpi and tarsi. Chaudoir put *Homethes* near *Stenocheila*, but Mr. Sloane tells me he thinks it should be included with the Anchomenini, where I leave it, at all events until an opportunity occurs of studying that group.

Anomotarus sericus, sp. n.

Length 4·25–5·5 mm.

Piceous, upper surface dark æneous, elytra sericeous: joint 1 of antennæ, base of palpi, and tarsi brown; rest of legs (except knees piceous) and extreme apex of both palpi and antennæ flavous.

Head convex, neck subconstricted, frontal foveæ short and not very deep, eyes not prominent, genæ well developed but shorter than eyes, mentum with a fairly long tooth, rounded at apex, last joint of labial palpi securiform in ♂, cylindrical in ♀, antennæ fairly stout, pubescent from middle of joint 4, surface minutely punctate. *Prothorax* moderately convex, cordate, a fifth wider than head and as much wider than long, base a little produced at middle, its sides slightly oblique, barely wider than apex, widest before middle, sides finely bordered, bisetose, gently rounded in front and sinuate quite close to base, hind angles a little reflexed and very sharp, though slightly obtuse; median line moderately deep, front transverse impression shallow, basal foveæ very short but fairly deep, converging forwards, midway between median line and angles, an elongate pit on each side of disk in front, surface transversely strigose and minutely punctate, coarsely wrinkled along base and in marginal channels. *Elytra* rather flat, very slightly dilated behind, three-fourths wider than prothorax, a third longer than wide, base emarginate, shoulders evident but rather rounded, apex rather sharply truncated but hardly emarginate, outer angles rounded; striæ distinctly impressed up to apex, with traces only of crenulation, intervals slightly convex, 3 with two pores on the interval at about two-fifths and three-quarters. Some faint depressions occur here and there, giving the elytra a slightly tessellated appearance, also an elongate depression on stria 3, just behind middle, which is much deeper in the type than in the other specimens. Microsculpture of prothorax and elytra consisting of excessively fine transverse lines, which form very wide meshes; that of the head formed by very small isodiametric meshes. Metepisterna elongate; venter smooth, with a single marginal seta on each side in the ♂, two in the ♀; tarsi with joint 4 entire, claws each with about three well-developed teeth.

About the same size as *A. stigmula*, Chaud., but without any pale markings on the elytra, the head relatively smaller, the prothorax with sharper hind angles and a rougher surface, the elytra a good deal shorter and with a much more uneven surface.

Bindjei (*C. R. Pfister*—type), 1 ex.; D. Tolong (*E. Modigliani*—Genoa Civic Museum), 1 ex. The species also occurs in Java, and I have seen four examples in the Buitenzorg Museum collection labelled respectively:—Purmerend Bat. baai, Batavia, Krakatau, and Verlaten Eiland. The Javanese are a little smaller than the Sumatran specimens.

Calleida corporaali, sp. n.

Length 9·5–11 mm.

Piceous: elytra metallic green, bright in front, along sides, and near apex, but dull on apical two-thirds of disk, some reddish reflections at shoulders and near apex; two spots, not always divided, on vertex, and inner half of mandibles red; apex of palpi and lateral margins of prothorax testaceous; base of antennæ and trochanters brown.

Body winged. *Head* wide, flat, contracting rather rapidly to neck, which is constricted, frontal foveæ shallow, outwardly substriate in front, ending in a rounded depression on each side behind, eyes prominent, hemispherical, surface smooth, antennæ reaching basal sixth of elytra. *Prothorax* rather flat, cordate, a little wider than head, barely wider than long, base bisinuate, wider than apex, front angles quite rounded away, sides with reflexed margin, bisetose, gently rounded in front and sinuate behind at some distance from base, hind angles reflexed and projecting a little laterally, sharp but slightly obtuse; median line deep, shallower near apex, front transverse impressions very shallow, hind one deep at sides and joining the deep foveæ, which, starting from near the hind angles, run forwards on each side, becoming gradually shallower, and disappearing near front angles, surface very faintly transversely striate. *Elytra* rather flat, transversely depressed on each side behind base, faintly dilated behind, nearly twice as wide as prothorax and two-thirds longer than wide, shoulders rather square, sides slightly compressed at a third from base, apex obliquely truncate, the outer angles on each side with a very sharp tooth; striæ fine and finely punctate, very shallow on disk behind, 1 much deeper near apex, intervals slightly convex, flat on disk, 3 with two pores on the interval, at a fourth and near apex, 8 dilated near apex into a smooth rounded boss, surface rather uneven, except on disk. The meshes of the microsculpture are isodiametric on elytra and head, very faint on the latter; on the prothorax they are very wide, but almost invisible. Metepisterna elongate; last ventral segment with two marginal setæ on each side in the ♀; in the ♂ there is only one seta on each side and the margin is excised at middle. Tarsi with joint 4 strongly bilobed, ♂ pro- and meso-tarsi with the three basal joints dilated and clothed beneath with rows of whitish spongiose scales.

I have compared the examples described above with the type of *C. terminata*, Waterh., from Sarawak. The new species is wider, without the purple patch at the apex of the elytra; the prothorax is smoother and its hind angles blunter; the elytra are more dilated behind, with a raised boss near the apex of interval 8.

Brastagi, 1 ex., and Bandar Baroe, 1 ex. (both *J. B. Corporaal*). I have also seen three examples in the collection of the F.M.S. Museum, viz., Selangor, Kuala Lumpur, Gombak Valley (*H. M. Pendlebury*), 1 ex., Perak, Gunong Kledang, 1 ex., and North Borneo, Kudat (*C. Boden Kloss* and *H. M. Pendlebury*), 1 ex. The Selangor and Perak examples agree exactly with those from Sumatra, but the Bornean specimen is a little smaller and narrower, with a touch of deep red at the apex of the elytra, so that it approaches more nearly to *terminata*.

XL.—*Some Parasitic Nematodes from the Uluguru and Usambara Mountains, Tanganyika Territory.* By H. A. BAYLIS, M.A., D.Sc.

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THE following notes deal with a portion of a collection of parasitic worms made by Mr. A. Loveridge, of the Museum of Comparative Zoölogy, Harvard College, during an expedition in Tanganyika Territory in the latter part of 1926. Part of the material has already been studied and reported upon by Dr. J. H. Sandground, of the Department of Tropical Medicine, Harvard College (Sandground, 1928). Through the kindness of Mr. Loveridge and of Dr. T. Barbour, Director of the Museum of Comparative Zoölogy, the remainder of the collection was sent to the writer for determination. The present paper consists of an annotated list of the species, with descriptions of three new forms. Co-types of the latter will be deposited in the British Museum (Natural History) and in the Museum of Comparative Zoölogy, Cambridge, Mass.

Order ASCAROIDEA.

Family **Ascaridæ.**

Subfamily ANISAKINÆ.

Amplicæcum africanum, Taylor, 1924.

Hosts and localities:

(a) *Rana nutti*; Bumbuli, Usambara Mts. (One female.)
(b) " Batrachian; Usambara." (Two females.)
(c) *Natrix olivaceus*; Amani, Usambara Mts. (One male, six females.)

The last-mentioned specimens (which are possibly the same as those referred by Sandground (1928) to "*Ophidascaris*, sp. indet.") may have been derived from a frog recently swallowed by the snake.

There is a very close resemblance between *A. africanum* and *A. bufonis* (Gedoelst, 1916), and a study of further material of both sexes may perhaps show that the differences which can be found between the descriptions of the two forms are due simply to individual variation.

Family Heterakidæ.

Strongyluris brevicaudata, Müller, 1894.

Hosts and localities :

(a) *Chamæleo fischeri multituberculatus* (=*werneri*) ; Mlalo, near Ambangula, Western Usambara Mts., xii. 1926.

(b) *Chamæleo fischeri matschiei*; Amani, Usambara Mts., xi. 1926.

This species has already been identified by Sandground (1928) from *Chamæleo fischeri multituberculatus* and from *C. dilepis dilepis.*

Family Oxyuridæ.

Hoplodontophorus flagellum (Hempr. & Ehrbg., 1828), Turner, 1921.

Two females only, from *Procavia brucei prittwitzi*, at Dodoma.

Thelandros sp. (near *T. micipsæ*, Seurat, 1917).

Three females only, from *Agama hispida*, at Bagilo, Uluguru Mts.

Oxysomatium loveridgei (Sandground, 1928).

Host: a Cœcilian (*Bdellophis vittatus*, Blgr.).

Hab. Intestine.

Loc. Vituri, Uluguru Mts., 28. x. 1926.

This species has already been recorded by Sandground (1928), under the name of *Aplectana loveridgei*, from the same host but from a different locality (Amani, Usambara Mountains). The present specimens, though their measurements are, on the whole, somewhat larger than those given by Sandground, agree closely with his description. The species is, however, clearly an *Oxysomatium*, and should be added to the list of species of that genus given by the present writer (1927). Of the species there listed as doubtful, *O. macintoshii* (Stewart, 1914) has since been more fully described by Karve (1927), and is certainly an *Oxysomatium*.

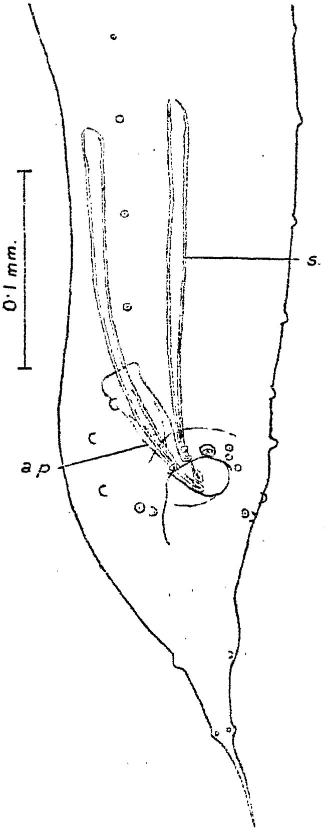
It seems desirable to point out here that Travassos (1927) appears to have misunderstood the writer's intentions in the paper referred to (Baylis, 1927), and to have thought that it was intended to show that the genera *Oxysomatium* and *Aplectana* were identical. This was by no means the case. A number of species which had been referred by certain authors to *Aplectana* were removed to *Oxysomatium*, but *Aplectana* still stands, with the genotype *A. acuminata* (Schrank, 1788).

Travassos also states that his species *O. simples* cannot be included in the genus *Oxysomatium* (*sensu* Baylis), and proposes for it a new genus *Raillietnema*, "caso venha a se demonstrar estar a razão com Baylis." No reason is given for this step, and the original description (Travassos, 1925) of *O. simples* does not appear to indicate on what grounds the species is thought to differ generically from the others assigned by the present writer to *Oxysomatium*. The genus *Raillietnema* therefore appears to be superfluous.

Walton (1928), who does not seem to have been aware of the writer's (1927) attempt to reduce the group to order, has further complicated matters by removing *Oxysomatium* from the Oxyuridæ to the Kathlaniidæ. The only reason given for this step is a certain resemblance of the œsophageal bulb, in some species, to that of the Kathlaniidæ. A certain residue of species, to which this character is thought not to apply, is placed in a new genus, *Oxysomoides*, which is allowed to remain in the family Oxyuridæ. One of these species is *O. macintoshii*, in which (as the writer has verified by reference to specimens of both species) the bulb has precisely the same structure as in *O. longespiculum*, the type of *Oxysomatium*. This is not the structure of the bulb in the Kathlaniidæ, where the bulb is more or less dumb-bell- or hourglass-shaped, and consists of two distinct swellings separated by a "neck." In *Oxysomatium* there is a short region of the œsophagus, immediately preceding the bulb proper, not of wider diameter than the rest of the œsophagus, but showing a slight differentiation of its muscular structure, so that it partakes rather of the nature of the bulb than of that of the main part of the œsophagus. This feature, although not shown in Sandground's figures, is present also in *O. loveridgei*. In the absence of any of the other features specially characteristic of the Kathlaniidæ, it does not, in the writer's opinion, warrant the removal of *Oxysomatium* to that family.

Oxysoma tricirratum, v. Linstow (1901), which is taken by Walton as the genotype of *Oxysomoides*, is very briefly described, and it is merely stated that the œsophagus "endigt mit einem kugelförmigen Bulbus." There is no indication as to whether there was or was not, in v. Linstow's specimens, a prebulbar region with a structure different in appearance from the rest of the œsophagus. It is, in fact, quite possible that the species is a typical *Oxysomatium*, and that the genus *Oxysomoides*, Walton, will fall into synonymy.

Fig. 1.



Oxysomatium chamæleonis, sp. n.
Posterior end of male, ventral view. *a.p.*, accessory piece; *s.*, left spicule.

Oxysomatium chamæleonis, sp. n. (Fig. 1.)

Host: *Chamæleo fischeri matschiei*, Werner.
Loc. Amani, Usambara Mts., Nov. 1926.
Length, male 3·4–3·8 mm., female 4·6–4·7 mm. Maximum

thickness, male about 0·2 mm., female 0·3–0·33 mm. Cuticular striations extremely fine. Length of œsophagus, measured from anterior extremity and including bulb, about 0·6 mm. in male, 0·75 mm. in female. Length of pharynx 0·05–0·06 mm. in male, 0·07 mm. in female. Nerve-ring 0·23–0·25 mm. from anterior end in male, 0·3 mm. in female. Excretory pore 0·5–0·6 mm. from anterior end. Diameter (longitudinal and transverse) of œsophageal bulb 0·09–0·1 in male, 0·12 mm. in female.

Tail of male 0·17–0·2 mm. long. Caudal papillæ six pairs postanal, nine pairs and an unpaired precloacal papilla preanal, arranged as shown in fig. 1. The anterior lip of the cloaca bears a group consisting of the median unpaired papilla and three pairs of small papillæ. Spicules 0·19–0·22 mm. long, apparently with small hyaline caps forming blunt tips. Accessory piece about 0·075 mm. long.

Tail of female 0·25–0·27 mm. long, tapering to a slender point as in the male. Vulva 1·6–1·75 mm. from posterior end. Eggs average about 0·112 × 0·06 mm. in size, very thin-shelled, and hatching *in utero*.

This species is very similar to *O. perezi* (Gendre, 1911), from *Chamæleo gracilis* (French Guinea), but differs from it in its considerably smaller size and in many of its absolute and relative measurements. In particular, the length of the spicules in Gendre's species is given as 0·29 mm. and that of the accessory piece as 0·085 mm. Gendre mentions only five pairs of preanal papillæ and six pairs of postanal, whose arrangement is quite different.

Oxysomatium ? macintoshii (Stewart, 1914).

Host: *Nectophrynoides* [*Pseudophryne*] *vivipara*.

Loc. Vituri, Uluguru Mts., x. 26.

The specimens, consisting of females only, are referred with some uncertainty to this species, which has hitherto been recorded only from India and Burma. The writer has, however, seen other African material including both sexes, which appeared to be indistinguishable from *O. macintoshii*.

Family **Rhabditidæ**.

Rhabditis sp.

A number of specimens of what appears to be a species of *Rhabditis* occurred in the intestine of a skink (*Scelotes eggeli*) at Phillipshof, Usambara Mts. As this genus does not usually occur in the intestines of vertebrates, though some species are parasitic in insects, it may be suspected that the present individuals were derived from some insect eaten by the lizard. From the field-notes quoted in the report on the reptiles (Barbour & Loveridge, 1928, p. 166) under the heading of *S. eggeli*, it appears that beetles and cockroaches are regular items in the diet of this species.

Rhabdias bdellophis, sp. n.

Host: a Cœcilian (*Bdellophis vittatus*, Blgr.).
Hab. Lung.
Loc. Vituri, Uluguru Mts., 28. x. 1926.

Two examples of the parasitic phase. Length 5·1–5·6 mm. Maximum thickness 0·35–0·42 mm. Buccal capsule, if present, very vaguely defined. Œsophagus 0·4–0·45 mm. long, slightly swollen posteriorly, where it attains a width of about 0·09 mm. Nerve-ring about 0·16–0·17 mm. from anterior end. Tail conical and bluntly pointed, measuring 0·125–0·155 mm., and in both specimens sharply bent upon itself. Vulva exactly in middle of body. Eggs measure 0·125–0·137 mm. × 0·05–0·065 mm., and contain embryos *in utero*.

In the absence of knowledge of the free-living phase it is impossible to determine the relationships of this species with any certainty. It appears to be the first member of this genus to be recorded from a Cœcilian. Of the half-dozen species known to occur in Amphibia it approaches, perhaps, most nearly to *R. brachylaimus* (v. Linstow, 1903), recorded from *Bufo melanostictus* in Siam, but this is a form also known only in the parasitic phase.

Family **Mermithidæ.**

Mermis sp.

An immature specimen found in the stomach of the type male of *Hoplophryne rogersi*, Barbour & Loveridge, at Amani, Usambara Mts., 20. xi. 26. (Probably a "pseudoparasite," derived from some insect eaten.)

Order STRONGYLOIDEA.

Family **Diaphanocephalidæ.**

Kalicephalus colubri, Ortlepp, 1923.

Collected on two occasions from *Boædon lineatus* at Amani, Usambara Mts. Ortlepp (1923) records this species from a "colubrine snake" from East Africa. The spicules in the present specimens are up to 0·5 mm. long, while Ortlepp gives only 0·34 mm. as their length in the types.

Kalicephalus micrurus (Daubney, 1923).

A single young female, from *Natrix olivaceus* at Nyange, Uluguru Mts., is referred to this species. The type-host was *Macrelaps microlepidotus*, in Natal.

Order FILARIOIDEA.

Family **Spiruridæ.**

Subfamily *SPIRURINÆ.*

Protospirura muricola, Gedoelst, 1916.

Three specimens from the stomach of a squirrel (probably *Funisciurus vexillarius*) at Phillipshof, Usambara Mts., 21. xii. 26. This species appears to be very abundant and widely distributed in African rodents (see Baylis, 1928).

Subfamily *PHYSALOPTERINÆ.*

Physaloptera ortleppi, Sandground, 1928.

This species, recorded by Sandground from *Chamæleo dilepis*, occurred also in *C. deremensis* in the Usambara Mts., 20. xi. 26.

Physaloptera sp. (near *P. quadrovaria*, Leiper, 1908).

Host: *Hemidactylus mabouia.*
Loc. Bagamoyo.

Family **Camallanidæ.**

Procamallanus xenopodis, sp. n. (Figs. 2 & 3.)

Host: *Xenopus mülleri.*
Loc. Dar-es-Salaam, 4. xi. 26.

The material consists of three young males and three very immature females.

Their more important measurements (in mm.) are as follows:—

	Males.	Females (immature).
Length	1·06–1·37	0·74–0·78
Maximum thickness (under cover-glass pressure)	0·12–0·15	0·09–0·1
Cuticular striations, distance apart	Up to 0·00375	..
Length of buccal capsule	0·08–0·1	0·07–0·075
Anterior end to end of muscular portion of œsophagus	0·26–0·3	0·22–0·24
Anterior end to end of glandular portion of same	0·46–0·5	0·37–0·38
Anterior end to nerve-ring	0·13–0·15	0·11–0·12
Length of tail	0·03	0·04–0·05
Length of right spicule	0·1–0·11	..
Distance of vulva from posterior end	..	0·31–0·41

Fig. 2.

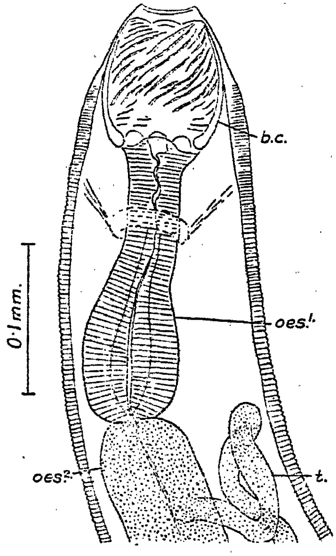
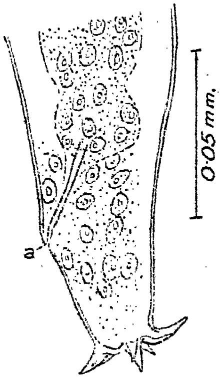


Fig. 3.



Procamallanus xenopodis, sp. n.

Fig. 2.—Anterior end of male; lateral view. *b.c.*, buccal capsule; *oes.*¹, *oes.*², the two portions of the œsophagus; *t.*, testis.
Fig. 3.—Posterior end of female; lateral view. *a.*, anus.

These are short, stout little worms, and the males have the caudal end ventrally coiled. The buccal capsule is barrel-shaped, and its walls are marked with interrupted and irregular ridges tending to take a diagonal or spiral direction The anterior, muscular portion of the œsophagus is distinctly club-shaped behind. The cuticular striations are relatively coarse in the males, but much finer in the young females.

The tip of the tail in the males is blunt and smooth. There are apparently about nine pairs of preanal papillæ, with long peduncles, and at least four pairs of postanal papillæ. Of these the three anterior pairs have long peduncles and are subventral, the posterior pair being lateral, large and sessile. The spicules are unequal, the left being apparently somewhat shorter than the right and much more slender.

In the females the tip of the tail (fig. 3) is armed with pointed spines, of which there appear to be constantly seven. One spine is terminal and median, while six others form a radiating crown. It is interesting to meet with a species of this genus in a batrachian. Three species have been described up to the present—*P. læviconchus* (Wedl, 1862), Baylis, 1923, *P. spiralis*, Baylis, 1923, and *P. parasiluri*, Fujita, 1927,—all from Siluroid fishes. The first two occur in Egypt, the last in Japan. In the presence of oblique ridges on the inner surface of the buccal capsule the present species resembles both *P. spiralis* and *P. parasiluri*. The interrupted character of the ridges also seems to be a feature of the latter, judging by Fujita's (1927) figure. In *P. spiralis* the ridges are much more regular and uninterrupted.

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XLI.—*A new Cestode from the Grey Parrot.*

By H. A. BAYLIS, M.A., D.Sc.

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DR. A. CONNAL, Director of the Medical Research Institute, Lagos, Nigeria, recently handed to the writer two specimens of a Cestode collected in Lagos by Dr. G. Taylor, by whom they have been kindly presented to the Museum. These worms had been evacuated by a tame grey parrot (*Psittacus erythacus*), and their loss was followed, according to Dr. Connal's information, by a marked improvement in the temper of the bird.

The specimens were preserved in formalin. Portions of one of them have been used for making stained preparations and sections, upon which the following description is mainly based.

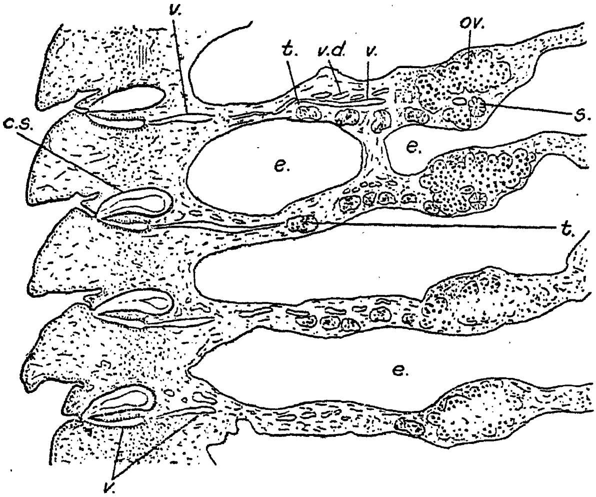
Raillietina (*Raillietina*) *taylori*, sp. n.

The length of a complete specimen is about 350 mm., and its maximum width about 5 mm. The scolex (when mounted in balsam) has a diameter of 0·46 mm. The suckers, which are armed with several rows of spines, measure about 0·2 mm. in diameter antero-posteriorly and 0·12 mm. transversely. The rostellum measures 0·13 mm. in diameter, and is armed with two alternating crowns of hooks, in all at least 160.

Those of the anterior crown are about 20 μ in length, those of the posterior crown about 17·5 μ.

The segments are very numerous, and all are broader than long. Throughout the greater part of the strobila they are extremely short, but their length increases considerably in the gravid condition. The genital pores are unilateral and each is situated in the anterior half of the margin of the segment. Mature segments appear early and their development to the gravid condition is rapid, so that the greater part of the strobila consists of segments filled with egg-capsules. The longitudinal musculature is well developed, but shows no clear distinction of outer and inner layers.

Fig. 1.



Raillietina (*Raillietina*) *taylori*, sp. n.

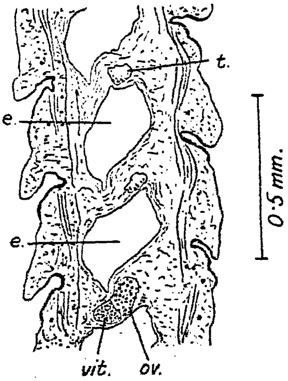
Portion of a horizontal section through four mature segments. *c.s.*, cirrus-sac; *e.*, *e.*, excretory canals; *ov.*, ovary; *s.*, shell-gland; *t.*, *t.*, testes; *v.*, *v.*, vagina; *v.d.*, vas deferens.

The most striking feature of the species is the enormous size of the ventral excretory canals, including their transverse connections, which, in mature segments, are wider than the strips of parenchyme (containing the genital organs) which separate them, and occupy about one-third of the dorso-ventral diameter of the strobila.

The dorsal excretory canals are of the usual narrow calibre. In certain sections a lateral branch can be seen coming off from the longitudinal canal at the level of the back of the segment, so that it appears probable that the dorsal canals, as well as the ventral, possess transverse connecting vessels.

The genital ducts pass between the dorsal and ventral excretory canals and dorsally to the lateral nerve. The cirrus-sac is somewhat pyriform, with a very thick muscular wall. It measures about 0·2–0·25 mm. in length and 0·08–0·1 mm. in greatest width. The vagina runs posteriorly to it and is almost straight. It has a terminal, club-shaped, muscular sphincter, about four-fifths the length of the cirrus-sac and a little more than a quarter of its width. Externally this portion of the vagina is covered with a coat of glandular cells. The rest of the vagina is of rather wide diameter, and appears to serve as a receptaculum seminis.

Fig. 2.



Raillietina (*Raillietina*) *taylori*, sp. n.

Portion of a sagittal section through three mature segments. *e.*, *e.*, excretory canals; *ov.*, ovary; *t.*, testis; *vit.*, vitelline gland.

The female glands lie towards the middle of the segment, the ovary consisting of a mass of vaguely-defined follicles, behind which lie the shell-gland and, ventrally, the vitelline gland. The testes lie on either side of the female glands, and extend as far as, but not beyond, the lateral excretory canals. There appear to be between forty and fifty testes, as nearly as can be estimated from serial sections. Of these about twelve lie on the poral side and thirty or more on the aporal side of the female glands. The vas deferens is slightly convoluted, but its general course is parallel to the vagina.

In the older gravid segments the medullary parenchyme increases in extent relatively to the width of the transverse ventral excretory canals, so that the whole segment becomes longer relatively to its width. The eggs become enclosed in egg-capsules, to the number of four to ten in each capsule. These capsules, so closely packed as to become discoidal, occupy the whole of the interior of the segment and extend beyond the lateral canals on each side. The diameter of the individual eggs (outer membrane) is 0·045–0·05 mm., while the contained onchospheres measure 0·017–0·018 mm. in diameter.

Eight species referable to the subgenus *Raillietina* have been described from various parrots. The species here described is a much larger form than any of them. The most frequently recorded species—*R.* (*R.*) *leptosoma* (Diesing) (which also occurs in the grey parrot and various other parrots commonly kept in captivity)—is about half the size of *R. taylori*, and has rostellar hooks only 11–13 μ long, while its egg-capsules contain up to twenty eggs each, according to Fuhrmann (1896). Like the present form, *R. leptosoma* appears to have exceptionally wide ventral excretory canals. *R. psittacea*, Fuhrmann, 1911, and *R. aruensis*, Fuhrm., 1911, have about the same number of hooks, and these are of about the same size, as in *R. taylori*, but both are much smaller forms and have fewer (twenty to twenty-five) testes.

The condition of the ventral excretory canals is very remarkable. As has been stated, these canals are also very wide (up to 0·27 × 0·08 mm., according to Fuhrmann) in *R. leptosoma*. Woodland (1927) has found that in one Cestode (*Avitellina centripunctata*) the paruterine organs discharge their eggs into these canals, which are here again of exceptional width. No evidence has been seen, however, of the canals having this function in the present species.

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THE ANNALS

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MAGAZINE OF NATURAL HISTORY.

[TENTH SERIES.]

No. 23. NOVEMBER 1929.

XLII.—*The Jurassic Flora of Sardinia.*
By W. N. Edwards.

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[Plates IV. & V.]

In 1912 Krasser figured and described some Bennettitalean fructifications from Sardinia, and in 1913 he published a preliminary note on the associated plants. A fuller account appeared in 1920, when Krasser showed that the flora was closely related to the Inferior Oolite flora of the Yorkshire coast. The two later papers were not illustrated, although two new genera and three new species were described, but there is little doubt that Krasser would have published figures of these and other forms had he lived longer. The description of one of the new genera, *Laconiella*, suggested so strongly a possible relationship with the highly interesting Caytoniales discovered by Dr. Hamshaw Thomas in Yorkshire, that an effort was made two years ago to trace the original specimens. (I have to thank Miss D. M. A. Bate and Prof. G. Stefanini for assistance in this matter.) Unfortunately Lovisato, who had collected the material, died in 1916, and it was not until quite recently that I found Lovisato's "collection B" (see Krasser, 1920) in the Botanical

Institute of the German University at Prague. This collection proved to contain the unique example of *Laconiella sardinica,* Krasser, as well as many other important specimens, and by the courtesy of Prof. K. Rudolph I was permitted to borrow a selection for detailed examination. An almost complete series of negatives (also generously placed at my disposal) accompanied the actual fossils, which had all been carefully arranged and labelled by Prof. Rudolph in accordance with Krasser's lists.

The geology of the Jurassic beds of central Sardinia has been described by Tornquist (1905), who figured three species of plants : *Ptilophyllum pecten* (from Laconi and Seulo), *Otozamites beani* and *Coniopteris* cf. *arguta* (from Crispisu, near Belvi). The last two have not been found elsewhere in the island, and the fern was very poorly preserved and scarcely identifiable.

Thirty-five species were recorded by Krasser from the neighbourhood of Laconi, a locality from which a *Brachyphyllum* was figured as long ago as 1857 (Meneghini). A re-examination suggests that this number should be slightly reduced, but the resemblance to the Yorkshire Oolite flora is strengthened. Figures are now given of the more important specimens, with critical notes where necessary.

Gristhorpia nathorsti, Thomas. (Pl. IV. figs. 1, 2.)

(1920. *Laconiella sardinica,* Krasser, p. 16.)

Krasser regarded the solitary specimen of this interesting plant as probably the fruit or seed-bearing axis of a cycadophyte, and his description is as follows :—

"Strong main axis with nearly opposite, thin-stalked, club-shaped lateral appendages (spoon-shaped in the impression).

"The main axis is about 40 mm. long and 2 mm. broad, and shows on each side the points of departure of six lateral axes (stalk 3 mm. long and 1 mm. broad, widening slightly towards the terminal portion, which measures 4 mm. × 4 mm.), of which, however, only four on each side are preserved. A carbonaceous layer is present in parts."

To this may be added that there are irregular longitudinal ridges on the main axis, and traces of fine markings or wrinkles on the lateral bodies radiating from the pedicels. The specimen has been damaged since Krasser's photograph was taken (Pl. IV. fig. 1), and only the lower half remains intact. There is now very little trace of any carbonaceous matter. A label with the specimen in Lovisato's handwriting states that he had kept the counterpart, which may therefore still be in existence, perhaps at Cagliari, but it could not be found two years ago, when Miss D. M. A. Bate visited the University.

The publication in 1925 of Dr. Hamshaw Thomas's full account of the two genera *Caytonia* and *Gristhorpia* from the Inferior Oolite of Yorkshire revealed the existence of a curious and isolated group of plants which Dr. Thomas has named the Caytoniales, and which he considers to have been essentially angiospermous in their fructification. A comparison of the Sardinian plant with these two genera shows that it is indistinguishable from *Gristhorpia nathorsti*, of which Dr. Thomas had several specimens in a fairly good state of preservation; he was able to make out many structural details which cannot be seen in the impression discovered by Lovisato.

Following Dr. Thomas's interpretation, the Sardinian specimen may be described as an infructescence bearing two rows of shortly-stalked, sub-opposite, more or less spherical fruits. As in some of the Yorkshire specimens, some of the fruits, presumably after ripening, have become detached, leaving a scar on the axis. The wall of the fruit was evidently thicker than in *Caytonia*, in which the outlines of the contained seeds can always be seen in mature fruits.

The identification of the Sardinian with the Yorkshire plant raises a rather important nomenclatorial question, since the name *Laconiella sardinica* was published by Krasser, with a description but no figure, in 1920. Thomas's account of *Gristhorpia*, with diagnosis and figures, only appeared in 1925, the name having been first published (without figures or description) in 1922 (Rep. Brit. Assoc. 1921, p. 452). By the rules of botanical nomenclature, however, names of new groups of fossil plants must be accompanied by illustrations or figures in order to be valid. The application of this rule would seem to be expedient in the present case, especially as the now familar *Gristhorpia* (which should date from 1925) was so fully described and figured from adequate and well-preserved material. The specific name *G. nathorsti* is adopted because no distinctive features can be discovered in the Sardinian specimen; further research on better-preserved material might reveal differences from the Yorkshire specimens, but at present there is no justification for using a separate name.

In the opinion of Dr. Thomas, the leaves known as *Sagenopteris* may very probably have been the foliage of the Caytoniales, and the genus is represented in Sardinia by

S. gœppertiana, Zigno, a form which is closely related to, though distinct from, the Yorkshire *S. phillipsi*. *Sagenopteris* was formerly regarded as a possible member of the Hydropterideæ, and it is therefore of importance to consider the supposed sporocarps, "similar to those of *Marsilia*," which Krasser (1920, p. 10) recorded from Laconi and included in *S. gœppertiana*. On careful examination, these turn out to be rather poorly preserved impressions of the phyllopod *Estheria*. In the opinion of my colleague Mr. T. H. Withers they are not specifically identifiable, but they closely resemble a flattened specimen in the British Museum (Geol. Dept.), from the Inferior Oolite of Scarborough, which is referred to *Estheria concentrica* (Bean).

Eretmophyllum lovisatoi, sp. n. (Pl. V. figs. 1–5.)

1920. *Podozamites lanceolatus*, Krasser (non L. & H.), p. 14.

Diagnosis.—*Eretmophyllum* leaves, with stomata on both surfaces, in irregular longitudinal lines. Veins fine, alternating with longitudinal rows of secretory tracts. Interstitial veins absent. Epidermal cells of both surfaces papillate.

Holotype.—Lovisato Coll., B 66; Deutsches Bot. Inst., Prague.

Locality.—Laconi, Sardinia. Middle Jurassic.

Certain incomplete leaves in the Lovisato Coll., closely resembling *Podozamites* in external appearance, have a well-preserved cuticle which shows that in fact they are Ginkgoalian plants belonging to the genus *Eretmophyllum*, founded by Dr. Hamshaw Thomas (1913) on material from the Lower and Middle Estuarine Beds of the Yorkshire Inferior Oolite.

The apex of one fragment (Pl. V. fig. 2) is obtusely rounded or, perhaps, very slightly retuse, and another piece shows the leaf tapering towards the base or petiole, which is not preserved. The average width is 1 cm., and the longest fragment is 4 cm. long. The Sardinian species was therefore probably narrowly lanceolate, but in view of the small amount of material and the variation in the two Yorkshire species, the form cannot be taken into account in framing a diagnosis, which is therefore founded on anatomical characters alone.

The chief characteristic of *E. lovisatoi* is the similarity of the two cuticles. In *E. pubescens*, Thomas, the upper and under surfaces of the leaf are very distinct, the former being devoid of stomata, and with papillæ less prominent than on the lower surface. In *E. whitbiense* a few small stomata occur on the upper surface, and papillæ are confined to the stomatal subsidiary cells of the lower surface. In *E. lovisatoi* stomata and papillæ are equally developed on both cuticles, which can only be distinguished by the more noticeable elongation of the cells above the veins on the upper surface. The walls of these cells resemble those of *E. pubescens* in being unthickened. The papillæ are not nearly so well marked as those on the lower epidermis of *E. pubescens*, and the veins seem to be finer. In the thickened walls of the subsidiary cells surrounding the stomata, *E. lovisatoi* agrees with *E. pubescens* rather than *E. whitbiense*.

The secretory tracts are visible to the naked eye as rows of small round dots (? resinous bodies). They are unaffected by maceration (Pl. V. fig. 3), and when the two cuticles are separated they can be detached as small disc-like bodies, or may remain attached to the upper epidermis. Dr. Thomas describes similar secretory tracts in *E. pubescens*, and they are known in the recent *Ginkgo* and in some fossil forms. They were probably mistaken by Krasser for stomata (which he mentions in his MS. notes with the specimens), as he does not seem to have macerated the cuticle. Of the four specimens referred to *Podozamites* by Krasser, nos. 66, 67, and 68 are certainly *Eretmophyllum* ; no. 96 I have not seen, but as Krasser's notes again refer to impressions of stomata in this specimen (*i. e.*, presumably the secretory tracts), it is also probably the same species, and *Podozamites lanceolatus* should be deleted from the list of Sardinian Jurassic plants. It seems possible that if the structure of the cuticle were known, other records of *Podozamites* might also have to be transferred to *Eretmophyllum*. The latter has so far been found only in Yorkshire, Sardinia, and Afghanistan (*E. saighanense* (Seward), of which the cuticular structure is unknown). The Italian *Podozamites zeillerianus*, Zigno, seems to me to be most probably an *Eretmophyllum*.

CRITICAL NOTES ON OTHER SPECIES.

Laccopteris.—From a limited amount of fragmentary and poorly-preserved material Krasser described four species of *Laccopteris*, namely, *L. elegans*, Presl, *L.* "*polypodioides*," *L. spectabilis*, Stur MS., and *L. woodwardi* (Leckenby). Of these, one of the two specimens named *L. elegans* is indistinguishable from some of the fertile fronds of *L. polypodioides* from Yorkshire, and there does not seem to be any justification for referring any of the Sardinian plants to the Rhætic species *L. elegans*.

The next species is stated by Krasser to resemble a specimen of *L. "polypodioides"* from Stamford figured by Prof. Seward (1899, p. 198, fig. 9 *c*, Brit. Mus. Coll., should be no. 52869), but which, as Krasser points out, differs from typical *L. polypodioides*. The Stamford specimen is, in fact, a characteristic fragment of *L. woodwardi*, and was later so named by Prof. Seward himself (1904, p. 89). I have not seen Krasser's specimen (B 73), but it may probably be a broad specimen of *L. woodwardi*. The pinnules of this species are rarely more than 6 mm. in diameter, and usually less, whereas the Sardinian specimen is 10 mm. *L. woodwardi* always seems to occur in a fragmentary condition, and there are several fertile pinnules in the Laconi material (*e.g.*, B 95).

The manuscript name *L. spectabilis* should be discarded forthwith; Krasser gives no figure, diagnosis, or description. One of the specimens to which this name is attached (B 64) is, in my opinion, unidentifiable; it may be *L. woodwardi*, and also resembles in habit some specimens of *L. dunkeri*, but is poorly preserved (Pl. IV. fig. 7).

The only two species of *Laccopteris* which can at present be admitted as members of the Sardinian Jurassic flora are therefore *L. polypodioides* (Brongniart) and *L. woodwardi* (Leckenby).

Otozamites lovisatoi, Krasser.—A small fragment, apparently from near the base of an *Otozamites* frond, was described as a new species by Krasser (1913, p. 34). I have not seen the actual specimen, but a photograph (Pl. IV. figs. 4, 5), which was fortunately preserved at Prague, shows that there is scarcely sufficient justification for founding a new species on this isolated and imperfect fragment. Krasser himself noted the close resemblance to certain French and Italian species, especially *O. recurrens*, Saporta, and *O. veronensis*, Zigno, and the distinctions which he endeavours to draw are either very slight or cannot be maintained. Thus he states that the pinnæ of *O. veronensis* are much broader than those of the Sardinian specimen, whereas, in point of fact, the basal pinnæ of a specimen of the former figured by Zigno (1881, pl. xxxiii. fig. 5) are either the same width as or narrower than those of the latter. Pending a revision of Saporta's and Zigno's species of *Otozamites*, which would probably reduce their number, the Sardinian specimen may be referred to *O. veronensis,* Zigno, which is also of Inferior Oolite age.

Cycadeospermum and *Carpolithus.*—Gothan suggested in 1914 (p. 128) that *Cycadeospermum persica* and *C. lovisatoi* (Krasser, 1912, pl. ii. figs. 11, 12) were seeds of *Nilssonia.* Krasser (1920, p. 17) was not inclined to accept this, though the resemblance to the seeds figured by Nathorst and Gothan seems to be very close indeed. I have not seen Krasser's figured specimens, which are apparently larger than any previously referred to *Nilssonia,* but there is another seed (B 100, Pl. IV. fig. 8), which Krasser mentions simply as *Carpolithus* sp., and which is exceedingly similar to some of the *Nilssonia* seeds figured by Nathorst (1909, pl. vi. figs. 1, 8). This specimen measures 5 × 4 mm. The other specimens referred by Krasser to *Carpolithus* are scarcely recognizable as seeds.

Williamsonia acuminata (Zigno).—Isolated involucral bracts, not very well preserved, and better regarded as unidentifiable. Zigno's Italian species is, moreover, not well characterized, and there seems no particular reason for including the Sardinian fragments under the same name.

Cf. *Pityophyllum nordenskioldi* (Heer).—An unidentifiable coniferous leaf.

Brachyphyllum.—A twig from Laconi was figured by Meneghini (1857, p. 278, pl. E, fig. 22) as *Brachyphyllum majus,* Brongniart. It is most probably *B. mamillare,* Brong., which was also recorded by Krasser. Brongniart's name *B. majus* was a *nomen nudum.*

Cryptomerites divaricatus, Bunbury.—Under this name must be included the specimens referred by Krasser to *Cheirolepis setosus* (see Pl. IV. fig. 9). They are typical examples of Bunbury's species.

Araucarites sardinicus.—This species was originally described by Krasser (1913, pl. ii. fig. 10) as *Cycadeospermum sardinicum,* but was afterwards transferred to *Araucarites.* The photographs of specimens B 50 and B 56 (Pl. V. figs. 6, 7) give a better idea of its nature and appearance than the original figure. As Krasser noted, several of the known Jurassic cone-scales are very similar.

Dadoxylon sp.—A piece of lignite from Tupe Caniga (near Laconi) in the Lovisato collection was studied with the help of collodion films (good sections were not obtained), and the radial structure showed that it is a conifer of definitely araucarian type. There are 1–2 rows of compressed pits on the tracheids, the rays are low and thin-walled, and there are apparently 4–10 small round pits in the field. A very similar wood has been recorded by R. Holden (1913, p. 540) from the Inferior Oolite of Scarborough, the only apparent difference being that the Scarborough wood has only 2–5 pits in the field. Among other woods, *Dadoxylon divesence* (Lignier), from the Lower Oxfordian of France, may be mentioned as a similar type.

Sardoa robitschekii, Krasser.—Krasser founded a new genus and species on a single obscure fragment of what he regarded as a stem showing quincuncially-arranged rhomboidal leaf-bases. I am inclined to think that it may be a piece of an old *Brachyphyllum* stem. It might, however, be an impression of a cone, and a rather distant comparison may be suggested with *Bernettia inopinata*, Gothan (1914, p. 146), a presumed cycadophyte fructification from the Lower Lias of Nuremberg. In view of the state of the present specimen (see Pl. IV. fig. 6), little can be said as to its nature and affinities, but Krasser's name may stand for the present.

There are a few species recorded by Krasser which I have not seen, but which I have included in the list of Sardinian Jurassic plants. These are :—*Todites williamsoni*, *Coniopteris hymenophylloides*, *Klukia exilis*, *Cladophlebis denticulata*, *Tæniopteris vittata*, *Baiera phillipsi*, *Czekanowskia murrayana*, *Brachyphyllum expansum*, and *Nageiopsis anglica*.

REVISED LIST OF PLANTS FROM THE INFERIOR OOLITE OF LACONI, SARDINIA.

EQUISETALES ...	*Equisetites columnaris*.
FILICALES.........	*Todites williamsoni*, *Coniopteris hymenophylloides*, *Klukia exilis*, *Cladophlebis denticulata*, *Dictyophyllum rugosum*, *Laccopteris polypodioides*, *L. woodwardi*.
CYCADOPHYTA ...	*Tæniopteris vittata*, *Nilssonia compta*, *Ptilophyllum pecten*, *Otozamites veronensis*, *Zamites* sp., *Williamsonia leckenbyi*, *W. sewardi*, *Cycadeospermum persicum*, *C. lovisatoi*, *C.* sp.
GINKGOALES......	*Eretmophyllum lovisatoi*, *Baiera phillipsi*, *Czekanowskia murrayana*.

CONIFERALES ... *Brachyphyllum expansum, B. mamillare, Pagiophyllum williamsoni, Cryptomerites divaricatus, Araucarites sardinicus, Dadoxylon* sp.
CAYTONIALES ... *Gristhorpia nathorsti.*
Incertæ sedis ... *Nageiopsis anglica, Sardoa robitschekii, Sagenopteris gœppertiana.*

Of these thirty-one plants, twenty-eight are fairly well defined, and twenty-one of the species also occur in the Inferior Oolite of Yorkshire. Of the remainder, four have close representatives in the Yorkshire flora. The species of *Cycadeospermum* are probably seeds of *Nilssonia*, which occurs in Yorkshire, and the only Sardinian genus not found in England is therefore *Sardoa*, a fragmentary and problematical plant. The most important result of this revision is that Krasser's *Laconiella* proves to be a representative of the Caytoniales, indistinguishable from *Gristhorpia*, Thomas.

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EXPLANATION OF THE PLATES.

Unless otherwise stated, the figures are of natural size, and are from Krasser's negatives.

All the specimens are from the Middle Jurassic of Laconi, Sardinia.

PLATE IV.

Fig. 1. *Gristhorpia nathorsti*, Thomas. B 24.
Fig. 2. Ditto. × 2.
Fig. 3. *Sagenopteris gœppertiana*, Zigno. B 35.
Figs. 4, 5. *Otozamites veronensis*, Zigno. A 59.
Fig. 6. *Sardoa robitschekii*, Krasser. B 46.
Fig. 7. *Laccopteris* sp. B 64.
Fig. 8. *Cycadeospermum* sp. (cf. *Nilssonia*), × 3. B 100. Photo H. G. Herring.
Fig. 9. *Cryptomerites divaricatus*, Bunbury. B 26.

PLATE V.

Fig. 1. *Eretmophyllum lovisatoi*, sp. n. Holotype. B 66.
Fig. 2. Ditto. B 67.
Fig. 3. Ditto. Partly macerated cuticle from B 66, showing secretory tracts. × 6. Photo F. W. Edwards.
Fig. 4. Ditto. Cuticle from B 66. × 64. Photo F. W. Edwards.
Fig. 5. Ditto. Stomata from B 66. × 380. Photo F. W. Edwards.
Fig. 6. *Araucarites sardinicus* (Krasser). B 50.
Fig. 7. Ditto. B 56.

XLIII.—*Lower Cretaceous Plants from Syria and Transjordania.* By W. N. EDWARDS.

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[Plates VI. & VII.]

I. INTRODUCTION.

The Lower Cretaceous floras of Europe, North America, and the Arctic regions are abundant and well-documented, but additional data from other parts of the world are much to be desired. Various small collections of Cretaceous plants have been received in the Geological Department of the British Museum in recent years, and some of these are described in the present paper. In Asia Lower Cretaceous plants are found in Japan and China, and also India (Sahni, 1922, 1928). A few plants are recorded below from Syria and Transjordania, but otherwise the continent is almost blank as far as the vegetation of this period is concerned. It is therefore of interest to consider a supposed occurrence of Lower Cretaceous plants from Mongolia. Berkey and Morris (1927, p. 63) state that beds at Ondai Sair, north of the Altai Mountains, "furnished fossil insects, fishes, and plants, as well as dinosaur bones, by which they were determined to be of Lower Cretaceous age." The fauna and flora had previously been dealt with by Cockerell (1924), and the plants recorded were *Baiera furcata, Phyllocladites* ?, and *Czekanowskia* sp. These determinations were admittedly uncertain, but if correctly identified, the plants would be Jurassic rather than Cretaceous. They are associated with several insects and an *Estheria* which give no definite indication of age, a fish usually regarded as Jurassic (*Lycoptera middendorfi*), and a new genus of reptiles, *Protiguanodon.* The palæontological evidence for the Lower Cretaceous age of the Ondai Sair formation cannot therefore be regarded as conclusive, and it has not yet yielded typical members of the Lower Cretaceous flora.

Some of the most widely-spread plants of this epoch appear to extend from the Neocomian to the Albian and sometimes the Cenomanian, and it is not at present possible to establish a sequence of floras. A small assemblage of Lower Cretaceous plant fossils cannot therefore be assigned with certainty, in the absence of other evidence, to any particular stage.

II. LOWER CRETACEOUS PLANTS FROM SYRIA.

Among some specimens submitted to the British Museum (Geological Dept.) by Prof. A. E. Day of the American University of Beirut, are several plant impressions of Cretaceous age. One small series (not dealt with here) is from the well-known Senonian fish locality Hajûla, but the remainder are from beds of uncertain age, either in or associated with the Lebanon Sandstone. Prof. Day writes that it is identical with the upper zones of the Nubian Sandstone of the South, but that while in Sinai the Nubian Sandstone goes down to the Carboniferous, at the south end of the Dead Sea to the Cambrian, and elsewhere to Archæan, in Syria the Lebanon Sandstone rests on Jurassic limestone. It is mostly unfossiliferous, but is succeeded by beds with *Trigonia syriaca* and *Clytherea libanotica* which are regarded by Douvillé and Zumoffen as Aptian. There has, however, been considerable confusion in connection with these beds, and a full discussion of the question can be found in a recent work by Zumoffen (1926). This author's Grès Lignitifère evidently corresponds to the Lebanon Sandstone; it is regarded as being probably Neocomian, and at any rate between the Upper Jurassic and the Urgo-Aptian. The occurrence of fossil plants in the Grès Lignitifère is briefly mentioned by Zumoffen (1926, p. 54). He describes a paper-coal which rests in places on a basaltic tuff, and says : "Ces gisements sont intéressants à cause des empreintes de feuilles qui les Fougères ou les Cycadées y ont laissées." I have not seen any further description of these plants, though as long ago as 1878 Fraas noted the occurrence of Cretaceous plants in the Lebanon. His collection of "leaves, stems, twigs, woods, and fruits" (p. 299), preserved in samoite from B'Kesin, was unfortunately ruined ; it was stated to contain, among others, dicotyledonous leaves and palm wood, and to be of mid-Cretaceous age. From the shales and sandstones of Djebaa Fraas records (p. 315) *Pterophyllum cretosum* and *Neuropteris recentior*. The former is compared with a figure of Geinitz's, and might possibly be a *Zamites*; the latter is possibly *Weichselia reticulata*. *Neuropteris recentior*, L. & H., is a Jurassic plant [=*Todites williamsonis* (Brongn.)], but there may have been a confusion of names with *Alethopteris recentior*, Ett. (=*Weichselia reticulata*). Fraas's two recorded specimens must, however, be regarded as unidentifiable.

In addition to the plants described below, Prof. Day has collected lignite from the Lebanon Sandstone at various localities (see also Zumoffen, 1926, p. 52). When any trace of structure has been preserved, the wood is seen to be coniferous. A single piece of well-petrified wood was found at Nab'-ul-Laban, north of Mt. Sannin (of doubtful age, but probably from the sandstone). Specimens of retinite were collected from between Ghabun and Bhawwarah; this may be from the bed referred to by Zumoffen (p. 54) as containing fossil resin, which has long been known from Lebanon (see Fraas, 1878, p. 316, and references there given).

Weichselia reticulata (Stokes & Webb). (Pl. VI. figs. 1–3.)

(For the synonymy of this species, see Seward, 1894, and Gothan, 1910.)

Locality and Horizon.—A couple of pieces of light brownish clay from Mudayrij (near Hammana, about 25 kil. east of Beirut) contain well-preserved fragments of the characteristic and widely distributed Lower Cretaceous plant *Weichselia*. Prof. Day writes: "Mudayrij is on a saddle between two river valleys, and the specimen collected in that neighbourhood by 'Abd-un-Nûr may have been in any formation from

Neocomian to Cenomanian. I think it likely to be Zumoffen's Vraconnian."

The *pinnules* (Pl. VI. figs. 1, 2) are from 3 to 10·5 mm. in length, crowded or open, either at right angles or slightly inclined to the rachis, rounded or occasionally obtusely pointed at the tip, and sometimes slightly contracted towards the base. The reticulate venation is usually clearly seen. The apparently unilateral arrangement seen in Pl. VI. fig. 2 is probably due to an original inclination of the pinnules to the rachis.

A fragment of *rachis* (Pl. VI. fig. 3) is 3·5 cm. broad, with longitudinal ridges from 1 to 2 mm. apart; between the ridges are numerous fine longitudinal striations, and occasionally one or two impersistent smaller ridges. Fine transverse markings can also be seen in places.

Since some of the pinnules here figured are larger than any previously recorded in *Weichselia*, the reference to *W. reticulata* might possibly be questioned. As I propose to review elsewhere our knowledge of the genus, I will merely state here the opinion that it is not yet possible to distinguish more than one species. The plant is also recorded below from Transjordania, and further material from Darfur has recently been collected by Mr. G. V. Colchester.

Zamites buchianus (Ett.). (Text-fig. 1.)

Locality.—Kafr 'Akab, E. of Mt. Sannin (Dr. Shukri Ma'lûf Coll.).

Horizon.—Probably from the Lebanon Sandstone. All formations from the Jurassic to the Turonian are represented in the vicinity.

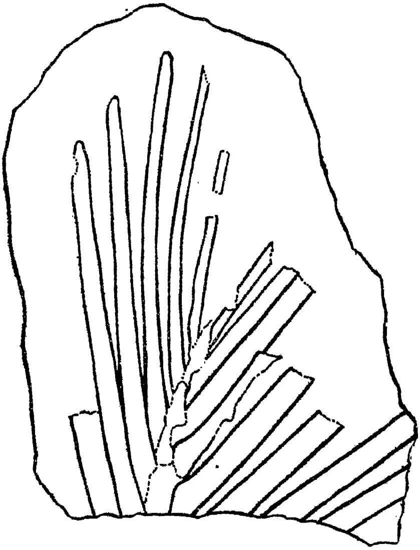
A fragment, 9 cm. long, of the apical portion of a cycadean frond, rather poorly preserved in a reddish sandstone. The attachment of the pinnæ is not clearly seen. The resemblance to *Zamites buchianus* (Ett.), a characteristic Wealden frond, is very close.

Zamites hoheneggeri (Schenk). (Text-fig. 3.)

1869. *Podozamites hoheneggeri*, Schenk, p. 9, pl. ii. figs. 3–6.
1872. *Glossozamites hoheneggeri* (Schenk), Schimper, p. 164.
1906. *Glossozamites hoheneggeri* (Schenk), Yokoyama, p. 36, pl. xii. fig. 1.
1923. *Otozamites hoheneggeri* (Schenk), Lipps, p. 354.

Locality and Horizon.—Lebanon; probably Lower Cretaceous. Exact locality uncertain.

Text-fig. 1.



Text-fig. 2.

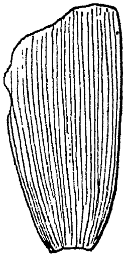
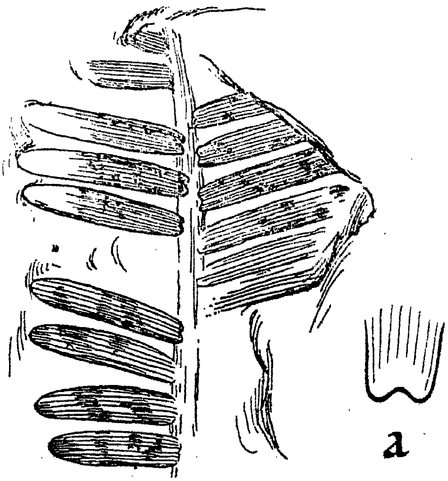


Fig. 1.—*Zamites buchianus*, Ett. Nat. size. B.M. (N.H.), Geol. Dept. V. 20481.

Fig. 2.—*Zamites* sp. Nat. size. V. 20475.

Text-fig. 3.



Zamites hoheneggeri (Schenk). Nat. size. V. 20480.

a, base of pinnule, × 3.

A single fragment of this frond agrees very closely with Schenk's original figures. The linear pinnæ, almost at right angles to the axis, are from 1·5–2·5 cm. long and about 4 mm. broad. The apex is obtuse; the base slightly contracted and symmetrically rounded, with a shallow central sinus. The veins, which are indistinct, are nearly parallel, and bifurcate occasionally. A certain amount of the original cuticle is present, but is not well preserved; the epidermal cells have sinuate walls, and the stomata, which are confined to the lower surface, are arranged in longitudinal rows. The detailed structure of the stomata could not be made out.

The distinctions between the genera *Ptilophyllum*, *Zamites*, and *Otozamites* are not clearly marked, and no two authors are agreed as to their delimitation. Some of the confusion is due to the different use of terms; thus Schenk, in his description of *Podozamites hoheneggeri*, states that the pinnæ are not auriculate ("die Oerchen an der Basis der Segmente fehlen"), whereas Lipps considers that Schenk's fig. 4, pl. ii., which shows an emarginate base (as in the present specimen) is auriculate, and therefore refers the species to *Otozamites*. This emarginate base (Schimper calls it cordate) is a not uncommon feature in figures of fronds which are referred to *Zamites* (e. g., *Z. recta*, Seward, 1903, pl. vi. fig. 11), but is rarely mentioned in the description. According to Halle (1913, p. 55), the only valid distinction between *Zamites* and *Otozamites* is that in the former the base is symmetrical and in the latter asymmetrical. On this basis the present species is certainly a *Zamites*, though in other cases it is often difficult to decide. For example, Prof. Halle describes a single specimen from Graham's Land as *Zamites pusillus* (1913, p. 56), and states that the pinnæ have a symmetrical, not auriculate, base; from his figure (pl. vii. fig. 12), however, one would have said that some of the pinnæ were not only asymmetrical, but slightly auriculate—more so, indeed, than his fig. 21 on the same plate, which he suggests is an *Otozamites*.

I follow Prof. Seward in discarding Schimper's genus *Glossozamites*; most of the species included in it seem to be typical *Zamites*, and others may be referred to *Otozamites*. Salfeld (1911, p. 215, pl. iii. fig. 6) described a specimen from the late Jurassic or early Cretaceous of Peru as *Glossozamites* (?) *hauthali*, and compared it with *G. hoheneggeri*; this specimen is, however, included in *Otozamites peruvianus*, Salfeld, by Berry (1922, p. 60).

Zamites hoheneggeri is related to the Upper Jurassic *Z. feneonis*, Brongn., which is somewhat larger and has acute or acuminate pinnæ, and is very close to the Kimmeridgian *Z. claravallensis*, Saporta (1875, p. 108, pl. xciii. fig. 1), which seems to have had obtuse pinnæ, though the specimen is very imperfect.

Z. hoheneggeri has been definitely recorded only from Urgonian beds in the Carpathians and from Lower Cretaceous beds in China. Yokoyama's figure shows a much greater contraction in the basal portion of the pinnæ than in Schenk's type material and in the Syrian specimen, so that the Chinese record may well represent a distinct species. Lipps compared a specimen from the Barremian of Hildesheim (1923, p. 354, fig. 24) with Schenk's species, but stated that it was probably distinct, an opinion with which I entirely agree.

Zamites sp. (Text-fig. 2.)

A few isolated pinnæ, apparently of a rather broad-leaved species of *Zamites*, occur in association with *Brachyphyllum* at 'Alayh.

Brachyphyllum obesum, Heer. (Pl. VI. fig. 5.)

Locality.—'Alayh, about 12 km. S.E. of Beirut.

Horizon.—From a clay-bed resting directly upon the Lebanon Sandstone.

Several specimens show very well the characteristic form of this Lower Cretaceous conifer, though the outlines of the individual leaves can only be faintly seen here and there.

Originally described from Lower Cretaceous rocks of Portugal, where it seems to be fairly common from the Urgonian to the Albian (Saporta, 1894), this species has also been recorded from the Wealden of England (Seward, 1895) and the Barremian of Hildesheim (Lipps, 1923, p. 365, no figures). A form which is, superficially at any rate, indistinguishable (*B. crassicaule*, Fontaine), has about the same range in America, and another exceedingly close species, *B. macrocarpum*, Newb., extends as high as the Senonian. In France there are similar species in the Upper Jurassic; and a sterile twig from the Cenomanian of Bohemia, described by Velenovsky (1889, pl. ii. fig. 1) as *Echinostrobus squamosus*, very closely resembles the Syrian specimens.

For a further discussion of *B. obesum* and its synonymy, see particularly Seward (1895) and Berry (1911).

Associated with *Zamites hoheneggeri*, in a small block of clay of uncertain locality, are fragments of a *Brachyphyllum* (possibly *B. obesum*) which can be detached and macerated. Specimens of the cuticle have been submitted to Dr. R. Florin, of Stockholm.

Mesembrioxylon libanoticum, sp. n. (Pl. VII. figs. 1–5.)

Locality.—Nab'-ul-Laban, N. of Mt. Sannin.

Horizon.—Uncertain. May be Upper Jurassic or Lower Cretaceous.

Holotype.—V. 20497 (with five slides), B.M. (N.H.), Geol. Dept.

Diagnosis.—Wood with compressed pits in one or two rows on radial walls of tracheids; feebly marked annual rings; abundant resin-parenchyma; one or two pits in the field, sometimes bordered and with an oblique pore, and sometimes replaced by a single large pit; numerous tyloses throughout the wood.

Description.—The most striking feature of this wood is the great abundance of tylose-like cross-connections in the tracheids, and this, taken with the structure of the annual rings, suggests that we have to do with a piece of root-wood. There are no resin-canals, but resinous wood-parenchyma is abundant and diffuse.

The bordered pits are apparently always in contact and compressed, and when in two rows nearly always alternate; in one or two places they are opposite, but still compressed. Several radial sections were examined, and at one place only the pits appeared to be separate, but the preservation at this point was not good, and it was impossible to be certain of the presence or absence of rims of Sanio. The pits are about 15 μ in height and 15–18 μ broad, and do not cover the whole of the radial wall. The tangential walls of the tracheids are unpitted.

The wood-rays are uniseriate, 1–10 cells high. There is no abietinean pitting, and the field-pitting, though often not well preserved, is podocarpoid. Sometimes nearly the whole field is occupied by a single large pit; it is noteworthy that these oöpores occur most frequently on the marginal cells of the rays (Pl. VII. fig. 1).

Affinities.—This wood evidently belongs to one of those extinct mesozoic conifers in which the combination of characters makes classification difficult. The arrangement of the bordered pits and the feebly-marked annual rings are both araucarioid, and if the main emphasis is to be laid on these characters the wood should be referred to *Dadoxylon*. Parenchyma is, however, rarely present, and still more rarely abundant, in araucarian wood, though it occurs among fossils in *D. septentrionale*, Gothan, *D. breveradiatum* (Lignier), and *D. macractis* (Caspary). These three species all differ from the present one in other characters. Parenchyma also occurs in the American Cretaceous *D. noveboracense* (Jeffrey) and *D. texense* (Torrey) ; the pitting of the ray-cells is not described in the former (Hollick & Jeffrey, 1909, p. 58), but in the latter there are said to be several to many oculipores in the field (Torrey, 1923, p. 89).

On the other hand, the podocarpoid field-pitting of the present species is strongly in favour of a reference to the form-genus *Mesembrioxylon*, in which xylem parenchyma is frequently common (in those species included by Gothan in *Podocarpoxylon*), and in which compressed and flattened pits do sometimes occur (especially in Gothan's *Phyllocladoxylon*). Two species in particular with compressed pits may be compared with the present one, namely *M. bedfordense* (Stopes), from the Aptian of England, which differs in having only one pit in the field and uniseriate pits on the tracheids (as well as in the well-marked annual rings and absence of tyloses), and *M. araucarioides* (Holden, 1913, p. 536), from the Middle Jurassic of Yorkshire, which is inadequately described, but which appears to have a single oöpore in the field.

Reference may be made to a Permo-Carboniferous species of *Dadoxylon* from India (*D. indicum*, Holden, 1917), which is described as sometimes having large fusion pits (oöpores) in the field, but the rays sometimes have from two to four or several (?) smaller pits in the field, and do not seem to be podocarpoid.

I propose therefore to name this wood *Mesembrioxylon libanoticum*, sp. n.

III. NUBIAN SANDSTONE PLANTS FROM TRANSJORDANIA.

Fragmentary plant-remains from the Nubian Sandstone of Transjordania were collected by Messrs. B. K. N. Wyllie, K. A. Campbell, and G. M. Lees, and presented to the British Museum (Nat. Hist.) by the Turkish Petroleum Co.*. The plants suggest a Lower Cretaceous age for the beds in which they occur.

The specimens are from Wadi Jabbok (Zerka), 100 feet above river-level, at Jerash-Rummein road crossing, about

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* For some of the specimens I am indebted to Dr. Hamshaw Thomas, to whom they had been handed for a preliminary examination.

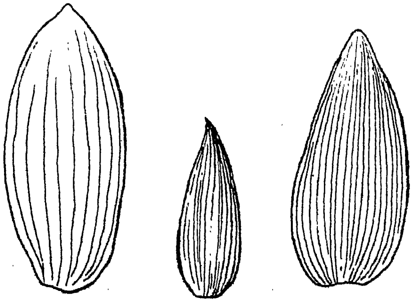
500 feet below the top of the Nubian Sandstone, in a fine-grained pinkish-brown matrix; and from Wadi Kenetri, 4 miles north of Mezraa, S.E. coast of Dead Sea.

Weichselia reticulata (Stokes & Webb). (Pl. VI. fig. 4.)

Localities.—Wadi Jabbok and Wadi Kenetri. There are also specimens in the British Museum Geological Department collected by Mr. G. S. Blake, and labelled Nahr es Zerka; they are probably from a point near the first-mentioned locality, but are in a whitish-grey matrix.

As stated above, a review of the characteristic Lower Cretaceous plant *Weichselia* will be published elsewhere. The numerous Transjordanian specimens show a fair amount of variation, and, in addition to fragments of pinnæ, there are impressions of the rachis.

Fig. 4.



Isolated cycadean pinnæ from Transjordania, all × 2.
V. 20508–V. 20510.

INCERTÆ SEDIS.

(*a*) Two specimens from Wadi Kenetri (V. 20503–4) may represent another species of fern-frond, but the venation is not preserved, and it is uncertain whether or not they belong to *Weichselia.*

(*b*) Several specimens from Wadi Jabbok are probably isolated cycadean pinnæ, either of *Zamites* or *Otozamites*; some of them, however, might possibly be referred to *Podozamites* (text-fig. 4).

(*c*) An obscure specimen from Wadi Kenetri might perhaps be a cycadean fructification (Pl. VII. fig. 6).

Summary.

The following fossil plants are described from the Lebanon region of Syria: *Weichselia reticulata*, *Zamites buchianus*, *Z. hoheneggeri*, *Z.* sp., *Brachyphyllum obesum*, and *Mesembrioxylon libanoticum*, sp. n. From Transjordania, *Weichselia reticulata* and cycadean remains are recorded. The plants are indicative of a Lower Cretaceous age.

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EXPLANATION OF THE PLATES.

All the figured specimens are in the Geological Department, British Museum (Natural History). The photographs on Pl. VII. figs. 1–5 are by Mr. F. W. Edwards, the remainder by Mr. H. G. Herring.

PLATE VI.

Figs. 1–3. *Weichselia reticulata* (Stokes & Webb), from Mudayrij, Lebanon.

Fig. 1. Nat. size, V. 20485.
Fig. 2. Nat. size, V. 20486.
Fig. 3. Rachis, × 2. On the reverse side of specimen V. 20486.
Fig. 4. *W. reticulata*, Wadi Kenetri, Transjordania. × 3. V. 20499.
Fig. 5. *Brachyphyllum obesum*, Heer. ‘Alayh, Lebanon. Nat. size. V. 20477.

PLATE VII.

Figs. 1–5. *Mesembrioxylon libanoticum*, sp. n. Nab‘-ul-Laban, Lebanon.

Fig. 1. Radial section, × 90. V. 20497 *c*.
Fig. 2. Radial section, × 90. V. 20497 *d*.
Fig. 3. Transverse section, × 90, showing feebly-marked annual ring. V. 20497 *a*.
Fig. 4. Radial section, to show field-pitting, × 540. V. 20497 *c*.
Fig. 5. Tangential section, × 90. V. 20497 *e*.
Fig. 6. Cycadean fructification? Wadi Kenetri, Transjordania. × 2. V. 20512.

XLIV.—*Rubber Bands on Mackerel and other Fishes.* By E. W. GUDGER, Bibliographer and Associate in Ichthyology, American Museum of Natural History, New York City.

[Plate VIII.]

INTRODUCTION.

About a year ago I published an article bearing the following rather unusual title, "A Mackerel (*Scomber scombrus*) with a Rubber Band Rove through its Body" (American Museum Novitates, 1928, no. 310, 6 pp., 3 text-figs). The account of this very remarkable phenomenon elicited widespread newspaper comment and aroused great interest. This resulted in the sending in to me of various other accounts, and these have been so interesting and so widespread in time and space as to make it worth while to put them on record. However, it will be necessary, first of all, to give a brief résumé of the article referred to so as to lead up to the subject.

MACKERELS WEARING RUBBER BANDS.

My mackerel was taken July 31, 1927, off Montauk Point or Block Island, near the northern extremity of Long Island. It was remarkable for having an unbroken rubber band extending through the body and across the back. The band was without knot or visible point of junction of ends, *i. e.*, had been cut (as such are) from a piece of rubber tubing like a bicycle inner tube. It extended straight across through the body cavity just below the alimentary canal, and lay across the anterior part of the spiny dorsal. In the body it had cut two grooves, one squarely over the holes in the flanks of the fish, and one slightly further back in an oblique position. These are all plainly shown in Pl. VIII. figs. 1, 2, & 3.

The anterior groove was plainly the older. It was clearly marked across the whole back, was shallower on the right side, and twice as deep on the left. It was deepest on the dorsal surface, where the strain was greatest. Here it had produced bendings or breaks in the first four spines of the dorsal, permanently deforming them. The groove was devoid of scales, but the integument had regenerated across its sides and bottom and was tough and leathery.

Later the band became displaced backward 17 mm. (0·7 inch), and cut a new groove across the back wider and deeper than the preceding, and in this the band was lying when the fish came to me. This groove was not a mere scaleless depression, like the other, but a clear cut through the skin and into the muscle segments. This groove had a maximum width on the left side of 6 mm., on the dorsum of 4 mm., and of 9 mm. on the right side. Extending across the dorsal fin, the band, by pressure, had again caused deformation or breakage in four spines.

It is plain that the anterior groove is the older, since it had regenerated the tissue in the bottom, and that the band had shifted back from it to cut the fresh groove in the raw flesh which it was occupying when the fish was caught.

Concerning this phenomenon, there are two questions to be asked and answered. First, how did the fish acquire the rubber band; and, second, how did it become rove squarely through the fish's body? The first question applies to all fishes adorned with rubber bands, and will be considered at the end of this article, after all the accounts have been presented. As to the second, the following fact gives us some faint clue as to the *modus operandi*. On the right side of the fish a faint but distinct line extends downward from the hole to and across the belly, and upward on the left side to the left hole. On the left side this is hardly so clear as on the right, since, in preserving the fish in alcohol, the abdominal wall became creased and indented in the line of the left groove, but it is still faintly visible.

Here is my conjectured explanation. The fish acquired the band when young, and as it grew and its circumference increased the band exerted greater and greater pressure on the soft abdominal walls. Presently it cut a groove in the soft ventral body wall. The groove became deeper, the walls of the groove fused, the tissues regenerated, and thus the band slowly made its way to the position it occupied when the fish came to my hands. On the face of the matter there is no other possible explanation. But lest this should seem preposterous, the reader is referred to an earlier paper of mine *, in which I have recounted dissections of my own and of others in which such bodies as knives, fish-backbones, slender fishes themselves, and in one case a small crab, had penetrated into the body cavity or into the muscles of fishes, and, becoming imbedded there, had remained comparatively unchanged for considerable periods of time, the tissues completely healing up, and giving no hint as to how the penetration had been effected.

As has been stated, the publication of my article on the mackerel and its rubber band, and the comments thereon in the daily press, aroused considerable interest, and brought in some further accounts, mainly from Boston, since that city is particularly the headquarters of the mackerel fishing industry in this country. First, Dr. Francis Harper, of the Boston Society of Natural History, sent me brief notices from the Boston 'Herald' of June 9, 1926, and the Boston 'Evening Globe' of May 11, 1928, of mackerel wearing rubber bands which had been landed at the South Boston Fish Pier.

Then Mr. Frederick F. Dimick, the efficient secretary of the Boston Fish Bureau, very kindly wrote me that for a great many years a few mackerel had been caught almost every year with rubber bands around their bodies in the head region. Then he added the following interesting and valuable excerpt from his 'Annual Report of the Boston Fish Bureau for 1894':—

"During the past few years, at different periods, mackerel have been caught which have had rubber bands around their bodies.

"One was brought into this city about two years ago by the schooner 'Georgie Willard,' caught off Boon Island; another was caught off Annisquam; another was caught this season in a trap at Provincetown; another on the coast of Maine.

"Two of these mackerel examined in this office had the band similarly located just back of the pectoral fins, and covering the ventral fins. In each case the bands had been on the mackerel long enough to have lost all their elasticity, and to have worn grooves in its flesh the size of the band. The bands were coloured white, probably from being in the salt water a long time.

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* Gudger, E. W., "Foreign Bodies embedded in the Tissues of Fishes." Natural History, 1922, vol. xxii. pp. 452–457, 6 figs.

"When we make such an unusual catch as this, we naturally ask ourselves the question, 'Who placed these bands on the mackerel, and at what time and place?' Perchance somebody in Ireland or Norway or some distant part of the world.

"Our reports are circulated in almost every haven in the world where the common mackerel is caught and cured. If the party who placed these bands on the mackerel would make himself known we might gain some inferences and conclusions in regard to the life history of the mackerel that we do not now possess."

Again, in his 'Report for 1925,' Mr. Dimick has this interesting note, showing that banded mackerel are still being caught off the New England coast:—

"During the past season we have received at different times mackerel which have had rubber bands, the common light elastic bands such as are used in offices, around their bodies, in most cases . . . just back of the [pectoral and pelvic] fins. For more than twenty years, at different periods, mackerel have been caught by fishermen having these bands on them. The Government has never put on such bands. It is a great mystery how they were placed there."

These accounts have likewise been corroborated by Captain Horace O. Hillman, of Edgartown, Mass., a mackerel fisherman of long experience. He writes: "I have seen several mackerel with rubber bands around them much the same as you describe in your article."

Not only are American mackerel found wearing rubber bands, but European forms similarly adorned are also known. This we learn from the chief European student of this fish, Ernst Ehrenbaum *, who, in discussing the difficulties met with in his efforts at marking mackerel in order to study their growth and migration, says, anent our matter:—

"By way of a joke, the fishermen in different regions of the world sometimes put narrow rubber rings around the heads of mackerel and set them free with this adornment, which is usually fixed just before or behind the pectoral fins. Such 'banded mackerel' have often been recaught on the shores of France, as well as in Great Britain, in Sweden, in Germany, and even in the United States. The fish seem to support these rings pretty well, and the rings keep easily in position. This seems to indicate a convenient form of mark, and I think it would only be necessary to fix a cipher on it and place this label on the back of the animal so that it may be easily detected."

In the completed report listed above, Ehrenbaum again refers to this matter, makes the same general statement, and concludes thus:—

"When I myself endeavoured to affix similar rings, bearing

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* Ehrenbaum, E., "Report on the Mackerel. Preliminary Account." Rapports et Procès Verbaux des Réunions Conseil Permanent International pour l'Exploration de la Mer, 1912, vol. xiv. p. 7. Also "The Mackerel and the Mackerel Fishery," *ibid.* 1914, vol. xviii. p. 17.

a stamped mark, to the fish, I found that it was only possible to employ fish of a certain restricted average length, as the fish would otherwise lose the ring, or, on the other hand, be hurt by the pressure exerted. For this reason I have only been able to mark a very few mackerel in this manner up to the present. I still have hopes, however, of being able to arrive at better results by this means."

Mr. R. A. Nesbit, of the U.S. Bureau of Fisheries, has been engaged for several years in making statistical studies at the Boston Fish Pier. He has measured thousands of mackerel, and has had hundreds of interviews with mackerel fishermen. Hence his opportunities for noting fishes wearing rubber bands have been extraordinary. This phenomenon he declares to be "a surprisingly common one." He has been good enough to pass on to me the valuable data which is to follow. He writes that:—

"In most cases the bands are about the body of the fish, either just anterior to the first dorsal or just posterior to it. In some cases the band merely forms a groove, but is not embedded. In most cases, however, the band has cut deeply into the flesh, and frequently has become embedded and covered with regenerated skin. I have not noted any cases in which the body cavity has been invaded."

I regard as of prime importance this observation by Mr. Nesbit, that the skin and allied tissues frequently regenerate and cover over the rubber band. As I see it, this completely corroborates my conclusions, stated in 1928, and reiterated above, as to how the rubber band had come to be strung through the walls and across the cavity of the abdomen of my specimen.

Corroboratory of these matters is the experience of Mr. C. M. Breder, Jr., of the New York Aquarium, in tagging frogs. The tags are affixed by encircling the "small" of the body of the frog, just in front of the hind legs, with a bit of small fish-line. If this is put on too tightly, the cord will cut into the skin. Not infrequently Mr. Breder has found that the skin regenerates over and outside of the cord, and that this comes to lie in a little tube or tunnel, in which it is freely movable.

OTHER FISHES WEARING RUBBER BANDS.

Strange to say, considering the fairly large number of records for mackerel, there are surprisingly few for other fishes. This possibly results from the fact that no definite effort has been made to collect such data. However, Mr. Nesbit has noted one case of a bluefish, *Pomatomus saltatrix*, so adorned. More remarkable is his record that "in the summer of 1926 a swordfish (*Ziphias gladius*) bearing a band on its sword was brought to the Boston Fish Pier. I examined the sword, and personally removed the band from it. The band had cut a groove in the sword, and had completely lost its elasticity."

This curious and interesting fact is corroborated by Mr. Dimick, who says that in 1926 or 1927 his attention was called to a swordfish with a band on its sword. This is presumably the fish referred to by Mr. Nesbit.

HOW DO FISHES ACQUIRE THEIR RUBBER BANDS?

This is the ever insistent question, and, as promised above, an attempt will be made to answer it. In this endeavour, two possible explanations offer themselves. The one, previously suggested by Ehrenbaum, is that the bands have been put on the fishes by human agents, particularly fishermen, presumably as a hoax. The other is that the fish, while small, have swum into or otherwise thrust their heads into the bands. Both explanations will now be considered.

The first has the support of one of the greatest students of the mackerel—Ernst Ehrenbaum. At first thought his theory seems very plausible, but, as one goes deeper into the matter, it must be rejected; there are too many records, and they extend over too many years and too many countries. The records of the Boston Fish Bureau show receipts of banded mackerel from 1894 to 1926—thirty-two years, a third of a century. Mackerel-catching in our waters is nowadays chiefly done with nets and purse seines. While on cruises, mackerel fishermen find their work too strenuous to stop and perpetrate such "jokes" as are suggested. If the fishermen caught fish of saleable size these would never be banded and set free. The smaller specimens would pass through the meshes of the nets, and thus escape. If such were caught on hooks they would probably be used for bait or thrown overboard. It is, of course, possible that some few might be banded and set free, but one cannot believe that there would be enough of these to give the number of records cited above. The U.S. Bureau of Fisheries has for many years carried on growth and migration studies on fishes by tagging and setting them free. The numbers afterwards caught of those tagged is almost infinitesimally small. Furthermore, the case of the swordfish is in point. No one could catch and hold such a powerful fish while a rubber band was being slipped over its sword.

Thus, by a process of exclusion, I am led back to the conclusion expressed in my previous paper, namely, that the fish, when young, swam into or thrust its head into the rubber band. This came to rest around the greatest circumference of the body, *i.e.*, just behind or over the pectoral and pelvic fins, or, more often, just in front of the spinous dorsal. Then, as the fish grew, the band became taut, and by reason of its resiliency cut a groove in the skin and flesh, as my one specimen and the majority of Mr. Nesbit's showed. Certainly the swordfish could only have acquired its band by thrusting its sword into it.

In this matter I congratulate myself on having independently come to this opinion, since I find that Mr. Nesbit and Mr. Dimick, who have had the largest opportunities of all observers, have, by the same process of reasoning, come to the same conclusion.

How do these Rubber Bands get into the Sea?

If the conjecture of Mr. Dimick, Mr. Nesbit, and myself is correct—that the fishes acquire their rubber bands by swimming into them while young—then explanation must be made as to how the rubber bands get into the sea. And the first answer is that they have been thrown, with other waste materials, into the sea from passing vessels. But it will be properly objected that even the great numbers of such vessels would hardly supply enough bands to furnish the records set out above in comparison with the myriads of fishes in the sea. We must, then, go further into the matter.

For fishes feeding in or off harbours there is the possibility that the bands have come from street sweepings or débris carried away by rains or melting snows, or by the ordinary flushings of the streets. For those fishes taken in the New York region, or off our North Atlantic coasts, there is still another possible explanation. Our garbage and street-sweepings in New York are loaded on scows, and these are towed out to sea and their contents dumped overboard, some 20 or 25 miles off shore, to sink or to float hither and thither until they come to rest on the shores of Long Island or New Jersey. Thus William Beebe, in his 'The Arcturus Adventure' (New York, 1926, p. 374), has recorded, among numerous flotsam and jetsam taken 125 miles from New York City, the leg of a rubber doll and the rubber nipple from a baby's milk-bottle. This shows that large rubber objects will float, and certainly such small and light ones as rubber bands will also be carried along. Then, if one thinks of the thousands of rubber bands which find their way into waste-baskets or are dropped on the streets of New York daily, he must agree that off New York at least there will be a sufficiency of these to provide adornment for at least some fishes.

Now it is an established fact that mackerel are mainly surface feeders, and are more or less omnivorous. Furthermore, H. B. Bigelow and W. W. Welsh, in "Fishes of the Gulf of Maine" (Bulletin U.S. Bureau Fisheries for 1924, 1925, vol. xl. (pt. 1) pp. 190–203), have shown that the young are found inshore, even coming up to and feeding around docks, during the summer, and that they, like their parents, are omnivorous surface-feeders. Then it is a fair conjecture that young mackerel migrating northward in the spring might, off New York Harbour, run their heads into such floating rubber bands, and, having thus acquired them, would wear them until they had gone further north, had grown up, had been captured, and had furnished the data for the observations recorded in this article.

EXPLANATION OF PLATE VIII.

A mackerel (*Scomber scombrus*), with a rubber band rove through its body, seen from the right side (fig. 1), from above (fig. 2), and from the left (fig. 3).

XLV.—*New or little-known* Gerridæ.—II. *Indian Species.*

By Teiso Esaki, F.E.S., Department of Agriculture, Kyushu Imperial University, Fukuoka, Japan.

In the present paper some of the genera and species described by W. L. Distant * in 1910 from India are revised. A few of the types of these species are now preserved in the Indian Museum, Calcutta, and they were not available for the present study. Other types are at present kept in the British Museum (Nat. Hist.), London, and were examined by myself. My hearty thanks are due to Major E. E. Austen, D.S.O., and Mr. W. E. China, of the British Museum, for their kind help in the present study.

Gerris monticola, Distant.

(1, p. 141 ; 2, p. 142.)

This species should be referred to the genus *Chimarrhometra,* Bianchi.

Gerris raja, Distant.

(1, p. 142 ; 2, p. 144.)

Although this species was described under *Gerris,* it belongs to an entirely different genus of the subfamily Halobatinæ. This genus may be described as a new genus.

CRYPTOBATES, gen. nov.

Apterous Form.—Body more or less spindle-shaped, much narrowed anteriorly. Head small, vertex slightly convex, much projecting anteriorly, posterior margin straight. Eyes large, moderately rounded outwardly, a little protruded posteriorly, covering the humeral angles of pronotum; inner margins diverging posteriorly. Antennæ long and slender, first segment stouter than the rest, second the shortest, third much the longest. Rostrum very long, reaching the middle of mesosternum, third segment very long, fourth tapering into a sharp point. Pronotum short, both anterior and posterior margins straight, lateral margins rounded. Mesothorax much widened posteriorly, somewhat bell-shaped. Mesonotum very large, much longer than head and pronotum together. Metanotum more or less fused with the

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* Some undescribed Gerridæ, Ann. & Mag. Nat. Hist. (8) v. pp. 140–153 (1910) (referred in the present article as 1). The genera and species were redescribed and partly figured in Fauna Brit. India, Rhynchota, v. pp. 141–166 (1910) (referred to in the present article as 2).

first abdominal tergite, forming an oblong plate, which is only slightly shorter than mesonotum, provided with two somewhat W-shaped sutures, which divide the plate into two parts, the metanotum and the first abdominal tergite respectively. Anterior legs long and slender, no armature in both sexes, femur and tibia of equal length, tarsus short, about one-half of tibia, with the first segment much shorter than the second. Intermediate and posterior legs comparatively short, posterior femora more slender, but distinctly longer than the intermediate pair (apex of tibiæ and tarsi of both the pairs mutilated in the specimens studied). Abdomen small, second to sixth tergites nearly equal in length, but narrowed posteriorly. Connexivum very distinct. Male genital segments conspicuous but slender, two segments of equal length.

Macropterous Form.—Pronotum well developed, much extended posteriorly, antero- and postero-lateral margins straight; nearly rhomboidal in shape, with the apical end truncate and the posterior end much rounded. Hemielytra very long, extending considerably backwardly beyond the apex of abdomen, distinctly divided into basal (corium and clavus) and apical (membrane) parts, of which the latter is longer than the former. Veins distinct, as shown in the figure. Hind wings broad, but not studied in detail in order not to risk damaging the unique macropterous specimen.

Orthotype: *Cryptobates raja* (Distant) = *Gerris raja*, Distant, 1910.

The above description was made from the type-material (1 apterous ♂ and 1 macropterous ♀) of *Gerris raja*, Distant. Although this species was at first referred by Distant to *Gerris*, the genus *Cryptobates* is very remotely allied to the latter. It is apparently most closely allied to *Amemboa*, Esaki, but may be distingushed from the latter by the characters given below:—

1. The third segment of the antennæ is much the longest. (In *Amemboa* the fourth is the longest.)

2. The rostrum is very long, extending as far as the middle of mesosternum.

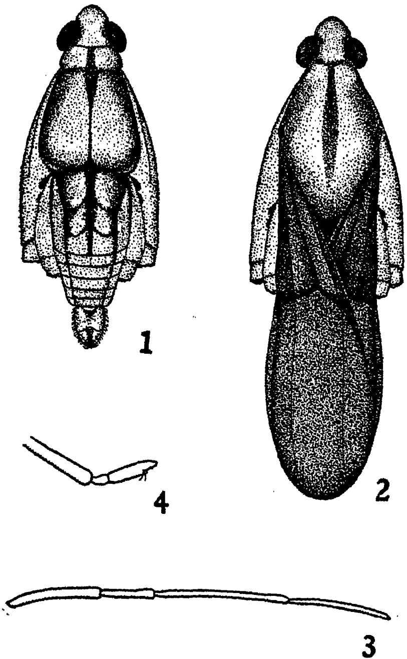
3. The metanotum is more or less fused with the first abdominal tergite forming an oblong plate, which is only slightly shorter than mesonotum.

4. The hemielytra are very distinctly divided into two parts.

5. No armature is present on the anterior femora in both sexes.

Redescription of Cryptobates raja (*Distant*). (Figs. 1–4.)

Apterous Form.—Body pale yellowish brown, with blackish-brown markings, under-surface a little paler, concolorous. Vertex pale yellowish brown, with lateral margins blackish brown. Eyes black and shining. Antennæ: first segment pale yellowish brown, with the extreme apex black; second sordid brown, with the apical half black; third and fourth entirely black. Rostrum pale yellowish brown, underside darker, the apex of the third segment and the entire fourth segment black. Dorsal surface of thorax pale yellowish brown; a median longitudinal stripe, which extends posteriorly from the pronotum as far as the end of the first abdominal tergite, sublateral stripes on pro- and mesonotum, which are gradated interiorly, lateral margins of metanotum,



Cryptobates raja (Distant).
Fig. 1.—Apterous form, ♂.
Fig. 2.—Macropterous form, ♀.
Fig. 3.—Antennæ.
Fig. 4.—Anterior tarsus.

and a thin stripe on each mesopleuron blackish brown. No marking on ventral surface. Legs pale sordid brown, but the apical half of tibiæ, tarsi, as well as three stripes on femora blackish brown. Abdomen sordid yellow above and beneath, with extreme posterior margin of each tergite, and sutures between tergites and connexiva blackish brown. Male second genital segment with a median blackish-brown stripe on the dorsal surface. Besides the structural characters given in the generic description, the following measurements may be of use for the determination of the species (30 units = 1 mm.) :—

Ratio of the antennal segments—i. : ii. : iii. : iv. = 20 : 11 : 29 : 23.

Ratio of the anterior tarsal segments—i. : ii. = 4 : 10.

Macropterous Form.—Pronotum dark yellowish brown, with a median stripe, which is very pronounced at the middle, but does not reach the posterior end, and lateral marginal stripes blackish brown. Hemielytra blackish brown, membrane a little paler, veins a little darker.

Length of body, ♂ (apterous form) 3·5 mm., ♀ (macropterous form, to the apex of hemielytra) 5 mm.; width of body, ♂ 1·5 mm., ♀ 1·8 mm.

This re-description is based on an apterous male and a macropterous female from Distant's type-material (British Museum), labelled : "Vurkalay, Travancore Coast, 10. xi. 1908," and "in small ponds near sea-shore, N. A." (*Nelson Annandale*).

Genus JUCUNDUS, Distant.

(1, p. 143 ; 2, p. 145.)

This is a synonym of *Rheumatogonus,* Kirkaldy, as discussed by me in a previous publication *. *Jucundus burmanus,* Distant, was based on a poor immature specimen of a *Ptilomera*-species.

Onychotrechus vadda, Distant.

(1, p. 144 ; 2, p. 146, fig. 79.)

As already pointed out by me †, this is the apterous form of *Onychotrechus sakuntala* (Kirkaldy), 1901.

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* 'Eos,' iii. p. 265 (1927).

† Ann. & Mag. Nat. Hist. (10) ii. p. 508 (1928).

Onychotrechus kumari, Distant.

(1, p. 145 ; 2, p. 147.)

This species belongs to the genus *Amemboa*, Esaki (vide *loc. cit.* p. 509).

Genus JANIAS, Distant.

(1, p. 145 ; 2, p. 148, fig. 80.)

This genus and its unique species *Janias elegantulus*, Distant, were based on a larval specimen. According to Mr. China, the type was first noticed to be missing from the collection of the British Museum, where it should have been found, in August 1923. Judging by Distant's figure, however, there is practically no doubt that the species represents nothing but an immature form of a *Cylindrostethus*-species, and very probably of *Cylindrostethus scrutator*, Kirkaldy, and the genus should be thus synonymized with *Cylindrostethus*, Fieber.

Genus URES, Distant.

(2, p. 149, fig. 81.)

This genus and its unique species *Ures custos*, Distant, were described from a larva of a *Gerris*, s. lat. The type is a very poor specimen (without antennæ !). Some characters given by Distant as of generic importance are quite unnatural, being caused by the shrinkage due to the teneral condition of the larval specimen. The species cannot be determined.

Genus EURATAS, Distant, and Genus FABATUS, Distant.

(1, p. 146; 2, p. 154, fig. 82, and 1, p. 147 ; 2, p. 155, fig. 83, respectively.)

Both of these genera were described from the material collected at the same time, and the latter was based only on larval stages as Distant himself states, "I have as yet only seen undeveloped forms." It may be quite safe to consider that the latter is the immature form of the former, if the descriptions and figures of both are carefully studied *. The type-material of both the forms was collected at the same time in the same locality, and at first it was preserved in spirit, then mounted. Many of the specimens were therefore discoloured and shrunk. Distant describes in the description of *Euratas*, "(pronotum with) two distinct foveate impressions on disk which are anteriorly margined with a carinate line," but this character is due to the shrinkage of the specimens. Annandale * gives a note on some fresh specimens which he secured later: "they are somewhat stouter and smoother in appearance than Mr. Distant's figure would suggest, and the impressions on the collar represented as deep pits are obsolescent." The long robust spine on the anterior tibiæ of the male may be a character of only specific importance. All the other characters agree perfectly with those of *Halobates*, Eschscholtz. It is, however, not at all allied to *Hermatobates*, Carpenter, as suggested by Distant. *Fabatus servus*, Distant, was also more exactly re-described by Annandale (*loc. cit.* p. 112) from fresh specimens, and he says that "the coloration is very characteristic." That coloration such as "leaden-grey" or "chocolate-brown" is quite typical of the larval forms of *Halobates*. It seems to me quite strange that a zoologist of Annandale's reputation should not have noticed the fact that *Fabatus servus*, Distant, was only an immature form of *Euratas formidabilis*, Distant. It must therefore be concluded that the genera *Euratas* and *Fabatus* are synonymous with *Halobates*, Eschscholtz, and that *Euratas formidabilis*, Distant, and *Fabatus servus*, Distant, are identical, and should be called as *Halobates formidabilis* (Distant).

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* Dr. D. Macgillavry, of Amsterdam, also studied these forms, and states in a label that both the forms may be identical specifically.

Genus GERASTRATUS, Distant.

(1, p. 148; 2, p. 160, fig. 87.)

This genus and its unique species *Gerastratus foveatus*, Distant, were based on a larval specimen of a *Metrocoris*-species, probably of *Metrocoris stâli* (Dohrn), as can be well judged by the description and figure given by Distant. The type of this species is preserved in the Indian Museum, Culcutta, and was not available for study. The "foveate disk" on the head may be again regarded as caused by the shrinkage of the specimen.

Genus VENTIDIUS, Distant.

(1, p. 149; 2, p. 156, fig. 84.)

This genus was synonymized by Bergroth † with *Metrocoris*, Mayr, but it is a very distinct genus.

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* Record Ind. Museum, vi. p. 111 (1911).

† Ann. Soc. Ent. Belgique, lx. p. 186 (1911); also see Esaki, Ann. & Mag. Nat. Hist. (10) ii. p. 511 (1928).

Genus EUODUS, Distant.

(1, p. 150; 2, p. 162, fig. 88.)

This genus and its unique species *Euodus communis*, Distant, were again based on a larval specimen of a *Metrocoris*-species. "The different structure of the abdomen above" and the "different shape of the head," given by Distant as differential characters from *Metrocoris*, Mayr, are due to the shrinkage of the type-specimen, which I examined carefully.

Genus NACEBUS, Distant.

(1, p. 152; 2, p. 165, fig. 90.)

Genus *Nacebus*, Distant, and its unique species *Nacebus dux*, Distant, are synonymous with *Rhagadotarsus*, Breddin, and its type *Rhagadotarsus kraepelini*, Breddin, respectively, as already pointed out by Bergoth and myself *. The rostrum of this species can never be described as "reaching the intermediate coxæ" as stated by Distant; it reaches, in reality, only the anterior pair.

The above discussions may be summarized as follows:—

Gerris monticola, Distant = *Chimarrhometra monticola* (Distant).
Gerris raja, Distant = *Cryptobates* (gen. nov.) *raja* (Distant).
Genus *Jucundus*, Distant = *Rheumatogonus*, Kirkaldy.
Onychotrechus vadda, Distant = Apterous form of *Onychotrechus sakuntala*, Kirkaldy.
Onychotrechus kumari, Distant = *Amemboa kumari* (Distant).
Genus *Janias*, Distant = *Cylindrostethus*, Fieber, **syn. nov.**
Janias elegantulus, Distant = Larval form of a *Cylindrostethus*, probably *Cylindrostethus scrutator*, Kirkaldy.
Genus *Ures*, Distant = *Gerris*, s. lat., **syn. nov.**
Ures custos, Distant = Larval form of a *Gerris*-species.
Genus *Euratas*, Distant = *Halobates*, Eschscholtz, **syn. nov.**
Euratas formidabilis, Distant = *Halobates formidabilis* (Distant).
Genus *Fabatus*, Distant = *Halobates*, Eschscholtz, **syn. nov.**
Fabatus servus, Distant = Larval form of *Halobates formidabilis* (Distant).
Genus *Gerastratus*, Distant = *Metrocoris*, Mayr, **syn. nov.**

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* Bergroth, Philipp. Jour. Sci. sec. D, xiii. p. 122 (1918); Esaki, Trans. Nat. Hist. Soc. Formosa, xii. p. 55 (1922), and Philipp. Journ. Sci. xxvi. p. 61 (1925).

Gerastratus foveatus, Distant = Larval form of a *Metrocoris*-species.
Ventidius, Distant ≠ *Metrocoris*, Mayr.
Genus *Euodus*, Distant = *Metrocoris*, Mayr, **syn. nov.**
Euodus communis, Distant = Larval form of a *Metrocoris*-species.
Genus *Nacebus*, Distant = *Rhagadotarsus*, Breddin.
Nacebus dux, Distant = *Rhagadotarsus kraepelini*, Breddin.

XLVI.—*Some new and little-known British Collembola.*

By JAMES MEIKLE BROWN, B.Sc., F.L.S., F.E.S.

[Plate IX.]

IN continuing the study of some of our rarer British Collembola, several of which have been dealt with in earlier papers (Brown, 6 & 7), a number of species have been examined, which are either new or have not yet received adequate treatment in this country. In the present contribution, descriptions of the following species are given:—

Xenylla börneri, Axels.
Willemia anophthalma, Börn.
Kalaphorura burmeisteri (Lubb.).
Isotoma delicatula, sp. n.
Sira platani (Nic.).
Orchesella terrestris, sp. n.

Family **Poduridæ**, Lubb.

Subfamily *HYPOGASTRURINÆ*, Börn.

Genus XENYLLA, Tullb.

The five species of this genus which are now known to inhabit this country may be discriminated by means of the following key, modified from Linnaniemi (14):—

1. Mucro and dens of the spring completely separate	*humicola* (Fabr.).
Mucro and dens combined	2.
2. Combined mucro-dens not longer than the claw of leg 3	3.
Combined mucro-dens distinctly longer than the claw of leg 3	4.
3. Mucro-dens much shorter than the claw of leg 3, and very rudimentary, bearing one dorsal bristle; size 0·6 mm.	*börneri*, Axels.

	Mucro-dens about as long as the claw of leg 3, bearing two dorsal bristles; size 1 mm.	*brevicauda*, Tullb.
4.	Anal spines small, on low papillæ which touch at their bases, inner lamella of the mucro-dens narrow, body-form broad; size larger, about 1·8 mm.	*maritima*, Tullb.
	Anal spines large, on erect papillæ touching at their bases, inner lamella of mucro-dens broad, body-form more slender; size smaller, about 1·2 mm.	*grisea*, Axels.

Of these five species *X. grisea* appears to be the commonest and most widely distributed in the north. *X. börneri* has only recently been added to the British list from material collected by me in Yorkshire and Derbyshire (8), and a description of the species is here subjoined.

Xenylla börneri, Axels.

Axelson, 1905, Zool. Anz. xxviii.
Axelson, 1912, Acta soc. sc. Fenn. xl. no. 5.

Colour whitish with bluish-white freckling. Underside paler. Skin finely granulated. Hairs short, with several longer ones on the lateral margins of the body-segments, and still longer ones at the posterior extremity of the body.

Eyes five on each side of the head, on a weakly pigmented eye-spot.

Postantennal organ absent.

Antennæ about two-thirds the length of the head. Segments iii. and iv. the longest, and segment i. the shortest, the last two segments provided with long hairs. Segment iv. with four short, broad, olfactory hairs and an apical sensory club.

Fork very rudimentary and diminutive. The mucro and dens not separate from one another, and the combined mucro-dens shorter than the manubrium, and less than half the length of the claw of leg 3. The two mucro-dentes arise from segment iv. of the abdomen widely apart, and each carries one prominent bristle. The tenaculum bears two barbs (Pl. IX. fig. 1, *a* and *b*).

Tibio-tarsus with two clubbed tenent-hairs. Claws slender and without teeth.

Anal spines small, arising from small papillæ, which are not distinctly separated at their bases.

Size 0·6 mm.

Habitat and Locality.—This species was first taken in numbers in moss growing on the bark of a fallen tree, near Hathersage (Derbyshire), 20. iv. 25; later in moss on the bark of an oak at Middleton-in-Teesdale (Yorkshire), 3. iv. 25;

and again in moss on a trunk in Bretton Clough (Derbyshire), 12. ii. 26.

The species seems to have been reported previously only from Finland (14).

Willemia anophthalma, Börn.

Börner, 1901, Zool. Anz. xxiv. p. 429.

The genus *Willemia* can be distinguished from the closely related genera *Xenylla* and *Achorutes* by means of the following scheme :—

(*a*) Eyes, fork, and tenaculum absent. Postantennal organ present, generally of five peripheral tubercles. Empodial appendage present	*Willemia*, Börn.
(*b*) Eyes present, five on each side. Fork present, but much reduced. Postantennal organ and empodial appendage absent........	*Xenylla*, Tullb.
(*c*) Eyes present, eight on each side. Fork present, generally well-developed. Postantennal organ present, generally of four peripheral tubercles. Empodial appendage generally present	*Achorutes*, Templ.

Willemia anophthalma is a small, white, inconspicuous species, about 0·8 mm. long, occurring in moss.

Head rather roundly triangular and comparatively large. Eyes absent.

Postantennal organ consisting of five (occasionally four) somewhat triangular tubercles arranged in a circle around the central tubercle, situated in a triangular depression somewhat free of skin-tubercles (Pl. IX. fig. 4). The central tubercle seen in optical section has the appearance shown in fig. 4, *b*.

Antennæ short, thick, and subconical, not quite as long as the head. Segment i. short and broad, segments ii. and iii. subequal, and segment iv. conical and shorter than ii. or iii. Segment iii. with two sensory rods and two tactile hairs, and segment iv. with a retractile apical papilla and four or five curved olfactory hairs (Linnaniemi, 14).

Mandibles with strong masticatory ridges and several terminal teeth.

Legs short. Tenent-hairs absent. Claws short, broad, curved, and without teeth. Empodial appendage about half the length of the claw, bristle-like but widening slightly towards the base (Pl. IX. fig. 5).

Apex of abdomen with two small curved anal spines, situated on very small papillæ not quite the length of the spines, and not nearly in contact at their bases (Pl. IX. fig. 6).

Hairs scattered and short, a few longer ones at the apex of the body.

Skin finely granulated with small papillæ, with some larger ones in the mid-dorsal line of the anterior segments.

This diminutive species seems to have been taken in this country in three counties only, viz.:—

Buckinghamshire (*Shoebotham*, 19).
Derbyshire (*Brown*, 8).
Somerset (*Womersley*, 22).

Subfamily *ONYCHIURINÆ*, Börn.

Kalaphorura burmeisteri (Lubb.).

Lubbock, 1873, "Monograph of the Collembola and Thysanura."

This species was first described by Lubbock under the name *Lipura burmeisteri* (15), and has more recently been referred to as *Onychiurus burmeisteri* by Collinge and Shoebotham (9). In 1901, Absolon (1) founded the genus *Kalaphorura*, which Handschin (12) distinguishes thus:—

1. Skin coarsely granulate. Pseudocelli without distinct chitinous marginal ring, very few in number. Postantennal papillæ two-branched. Empodial appendage with distinctly marked inner lamella. Fork rudimentary, dentes with forked bristles. Anal spines strong, on large papillæ .... Genus *Kalaphorura*, [Abs.
2. Skin not coarsely granulate. Pseudocelli with distinct chitinous marginal ring, often very numerous, and generally on all the body-segments. Postantennal organ with simple or granulate papillæ. Empodial appendage without distinctly marked inner lamella. Fork generally absent, when present without forked bristles on the dentes. With 2 or 4 (or without) anal spines .... Genus *Onychiurus*, [Gerv.

Lubbock's original description and figures are sufficiently correct to enable the species to be distinguished from the British species of the closely related genus *Onychiurus*, but the description is wanting in several matters of detail.

The body-form is characteristic, being widest at the third segment, and tapering strongly towards the posterior end and more slightly towards the head; while in the other species referred to the body is more parallel-sided. The head is comparatively large, and bears no eyes.

Of the segments of the antennæ, the first is shortest, the third rather longer than the second, and the fourth is the longest. The sense-organs on the third segment consist of two sensory rods, three broad sensory papillæ, two rounded clubs, and five strongly curved hairs.

The postantennal organs are situated in deep grooves and are generally difficult to see clearly, but consist of between twenty-five and thirty narrow oval papillæ closely approximated and arranged in a narrow elongate ellipse.

The legs are without tenent-hairs and the claws without teeth. The empodial appendage has a small narrow outer lamella grading into the terminal bristle, which reaches to rather beyond the middle of the claw (Pl. IX. fig. 2).

The anal spines are very large and arise on prominent papillæ, which widen gradually into the posterior segment of the abdomen.

Lubbock's original description makes no mention of either pseudocelli or spring, though both these organs are present.

Two pseudocelli occur on each of the antennal bases. They cannot be recognised elsewhere on the body-segments, but paired and symmetrically arranged circular areas without skin-granules are to be noticed, especially on the anterior abdominal segments. These may represent rudimentary pseudocelli (*vide infra*).

The fork or spring is present in a very rudimentary condition, being indicated by two rounded, closely approximated, granulated papillæ on segment iv. of the abdomen and representing the dentes, each papilla carrying three strong bristles, the two inner larger ones being forked before the apex (Pl. IX. fig. 3).

Lubbock's description of the skin-granules is not in agreement with what I find in my specimens. The granules are relatively large and prominent, but not of uniform size. They are particularly large on the head, and across the middle regions of the body-segments, and on segments i., iii., and iv. of the antennæ; while on the antennal bases, the anterior and posterior regions of the body-segments, on the antennal segment ii., and on the basal part of the antennal segment iii., they are very much smaller and more crowded. On the posterior two segments of the abdomen they are more uniform in size.

The body-hairs are short and scattered, with longer ones at the extremity of the abdomen, on the legs, and on the antennæ—the longest ones appearing distinctly blunt at the apex.

Colour whitish, with a slight tinge of yellow.

Size from 2 to 3 mm.

This species does not appear to be as common as the species of the closely related genus *Onychiurus*, at any rate in the north, but I have taken it in both Yorkshire and Derbyshire.

The British records include the following counties :—

Cornwall (*Marquand*).
Derbyshire (*Brown*).
Devonshire (*Parfitt*).
Hertfordshire (*Collinge & Shoebotham*).
Kent (*Lubbock*).
Somerset (*Womersley*).
Yorkshire (*Brown*).

The identity of the British species, as described above, with that taken by Handschin in Switzerland (12) appears to be clearly shown by the agreement in such critical structures as the antennal sense-organs, the peculiarities of the rudimentary spring, and in the disposition of the skin-granules. In the structure of the empodial appendage my specimens do not show such a sharply marked off outer lamella as that figured by Handschin (Taf. ii. fig. 64).

There now seems to be no doubt that *K. burmeisteri* (Lubb.) is conspecific with *K. tuberculata* (Moniez) and with *K. paradoxa* (Schäff.), although the published accounts of the continental species by different observers are not in complete agreement in matters of detail. Moniez (16), Schäffer (18), Absolon (1), and Handschin (12) do not record pseudocelli as present on the body-segments, Börner (3) describes them as present on thorax ii. and on abdomen iii. and iv., while Stach (20) finds them on each of the body-segments from thorax ii. to abdomen v. as a pair on each of these segments about the size of the skin-granules, while anteriorly on the same segments on each side of the middle line is a thin porous area of cuticle (which may correspond to the clear regions mentioned above). I have made a very careful search, under the highest powers available, in many cleared specimens, and have been unable to find any structure which could be recognised as pseudocelli on any of the body-segments. The clear areas of the cuticle certainly have the appearance of being porous or pitted.

The general characters of the rudimentary fork are in agreement, yet Börner mentions two bristles on each dens, while Absolon and Handschin give three, which number agrees with that found in the British species.

The synonymy thus seems to be:—

Kalaphorura burmeisteri (Lubb.), 1873.

Lipura burmeisteri, Lubb., 1873.
Lipura tuberculata, Moniez, 1891.
Aphorura paradoxa, Schaffer, 1900.

Family **Entomobryidæ**, Töm.

Subfamily *ISOTOMINÆ* (Schäff.).

Isotoma delicatula, sp. n.

Colour pale yellowish white, uniformly shaded and mottled with grey. Hairs short, adpressed and simple, and uniformly disposed over the body, with a few rather longer and more erect feathered ones on the dorsal parts of the abdominal segments and several still longer feathered hairs on the posterior segments.

Eyes three on each side, in an intensely black, somewhat triangular eye-patch. Ommatidia of uniform size and arranged as in Pl. IX. fig. 7.

Postantennal organ almost in contact with the eye-patch, broadly oval in shape, about twice as long as broad, the length being approximately equal to the width of the eye-patch (Pl. IX. fig. 7).

Antennæ about 1·2 times the length of the head, the relative lengths of the segments being as 4 : 5 : 5 : 9.

Legs without tenent-hairs. Claws without teeth. Empodial appendage about half the length of the claw, with broadly rounded inner lamella without teeth or projecting angle and slightly narrower outer lamella.

Spring reaching the ventral tube. Dens 2·75 times the length of the manubrium and dorsally ringed. Mucro with three teeth—a long slender apical one, a prominent dorsal one in the mid-line, and a particularly acute and long outer one—anterior to the dorsal tooth (Pl. IX. fig. 8).

Tenaculum with three barbs and two bristles.

Segments v. and vi. of the abdomen combined. The relative lengths of the abdominal segments as 7 : 8 : 9 : 10 : 9.

Size 0·7 mm.

Habitat and Locality.—Under moss on old trunks. Patterdale (Westmorland), iv. 25; Calver (Derbyshire), ii. 26; Sheffield (Yorkshire), iv. 26.

In body-form and structural features *I. delicatula* is closely allied to the group of species including:—

I. sphagneticola, Axels. (14)	with 0 ommatidia.
I. bipunctata, Axels. (14)	with 1 + 1 ommatidia.
I. menotabilis, Börn. (5)	with 3 + 3 ommatidia.
I. notabilis, Schäff. (17)	with 4 + 4 ommatidia.

From *I. menotabilis* (a species very closely related to *I. notabilis*, and perhaps conspecific with it (11 and 21)), to which it bears most likeness in the number of ommatidia, it seems to differ in the relative size of the postantennal organ, which in that species is equal to the eye-patch, in the relative position of the ommatidia, which is quite characteristic, in the form of the mucro, and in its habitat. In every case I have found the present species among moss on old or fallen trunks. The eye-patch is intensely black, and the pigment is very resistant to the action of caustic potash—a feature shared by *I. notabilis*.

Subfamily *ENTOMOBRYINÆ*, Schäff.

Sira (*Seira*) *platani* (Nic.).

1841. Nicolet, H., Mem. soc. Helv. sc. nat. v. p. 72.
1873. Lubbock, J., Monograph of the Collembola and Thysanura, p. 145.

I find no record of this species having been taken in Britain (at any rate, since Lubbock's time), but last year (Sept. 1928) I obtained it in numbers on the bark of the oak, in company with *Entomobrya nivalis*, L., and *E. albocincta*, Templ., near Bembridge (Isle of Wight). Its identity with the European species is manifest on comparing the disposition of the dark pigmentation of the body (Pl. IX. fig. 9).

The body-colour is yellowish, with a covering of dark brown hairs and scales, and with intensely dark purplish-black flecks and bands.

The dark pigment is disposed in the Isle of Wight specimens as follows:—

The eye-patches, and a curved anterior band connecting them and including the bases of the antennæ.

The anterior and lateral borders of the mesothorax, and the entire metathorax to nearly the lateral margins.

The lateral margins of the first abdominal segment. The entire abdominal segments ii. and iii., with the exception of some pale patches on the anterior and lateral parts of segment iii. A broad irregular band about two-thirds the width of the segment, and rather posterior to the middle, on segment iv., together with a narrow posterior band and some lateral flecks. The whole of segment v., except a narrow anterior band, and the entire segment vi.

The apices of the antennal segments i., ii., iii., and iv. and the apex of the femur of leg 3.

The abdominal segment i. is entirely pale, except for the lateral margins, and a transverse row of brown scales at the anterior margin. The underside is quite pale.

When seen side by side with the paler *S. nigromaculata*, Lubb., a species commonly found with us about window-frames, *S. platani* seems very different, and appears to be quite a distinct species, but, according to the recent revision by Handschin (13), the described species—*S. platani*, Nic., *S. corticalis*, Carl, *S. nigromaculata*, Lubb., and *S. flava*, Ågren—form a series of colour-varieties of one and the same species, exhibiting in the order given a gradual reduction in pigmentation, resulting in successive stages in the discontinuity of the dorsal dark bands, leading to the isolated pigment-patches seen in *S. nigromaculata* and *S. flava*. The intermediate form—*S. corticalis*—has not yet been found with us, but the paler anterior margin of the second abdominal segment in one or two of my specimens gives a suggestion of this variety.

The relative lengths of the abdominal segments iii. and iv. of my specimens are:—

in *S. platani* from 1 : 4 to 1 : 4·8,
in *S. nigromaculata* 1 : 6,

but this ratio is, according to Handschin, variable in each of the species.

I can find no difference in the structure of the claws or of the mucrones in the two species, but my specimens show, in addition to the paired teeth at the middle of the inner edge of the claws, two others in the apical half of the inner margin (Pl. IX. fig. 10), and not one only as shown in Handschin's fig. 9 and given in his description.

Lubbock, in his Monograph (p. 146), states that his specimens were found "on the bark of trees in company with *Psocus* etc., and on dry boards," but he gives no localities and does not state whether they were taken in Britain or in Switzerland (where he obtained some of his material), so it is possible that this is the first record for this country.

Orchesella terrestris, sp. n. (Pl. IX. figs. 11 & 12.)

Colour pale greenish yellow, with purple-black to bluish-black markings. Head pale, with eye-patch, a ring round the base of each antenna, a spot between the antennal bases, and another rather posterior to the middle of the disc dark. Cheeks dusky.

On the body-segments the dark pigment is arranged as follows:—

The anterior and lateral borders of the mesothorax, a double central longitudinal line in the anterior third, and sometimes also in the posterior third.

The lateral margins of the metathorax, an interrupted irregular transverse band near the anterior margin, a broad median longitudinal mark in the anterior half.

The posterior lateral margins of abdominal segment i. with a well-developed transverse band anterior to the middle.

A conspicuous median transverse band curving forwards laterally on segment ii. and posterior lateral patches.

A prominent, almost median, transverse band, nearly half the width of the segment, also curving forwards laterally, and slight lateral patches on segment iii.

On segment iv. an indefinite, ill-defined, transverse band anterior to the middle, a conspicuous posterior band near the hind margin, and several slight lateral flecks.

On segment v. two transverse bands, one near the anterior margin, the other at the posterior margin.

Abdominal segment vi. and the underside of the body pale.

Antennæ pale, with a dorsal apical spot on segment i. and the apex of segment ii. dark, segments v. and vi. dusky, the last darker towards the apex.

Legs pale, with the two basal segments dark-ringed, the third segment dark at the apex, the femur of leg 3 dark near the apex, the tibio-tarsi darker in the middle, the markings being more pronounced on leg 3.

Eye-patch dark. Eyes eight on each side, the two inner posterior ones only slightly smaller than the others.

Antennæ 6-segmented in fully developed specimens, nearly two-thirds the length of the body. The relative lengths of the segments in larger specimens as 3 : 10 : 4 : 14 : 21 : 32, but these are liable to variation.

Spring long, the relation of manubrium to dens being as 11 : 15. Mucro with two dorsal teeth and a basal spine.

Legs with one tenent-hair. Claws with three small teeth, one at the middle, and the others in the apical third. Empodial appendage lanceolate with a small outer tooth.

Body with a dense covering of brown adpressed hairs and the usual long, erect, ciliated, clubbed bristles, which particularly long and dense on the thoracic segments.

Abdominal segment iv. about twice the length of segment iii.

Size up to 3·5 mm.

Habitat and Locality.—Under limestone blocks which had fallen from a wall by the river side, Lathkill Dale (Derbyshire), viii. 1918.

One colony only was observed, and though similar habitats in the same and in other localities have been searched in the hope of finding further material, none has yet been obtained.

The present species appears to be quite distinct from the other British species of the genus, and though bearing some resemblance to certain European forms, is notably different in the arrangment of the dark markings of the body. The antennæ show the usual variation noted in other species of *Orchesella* (Brown, 7), in that segments may be missing, and the subsegmentation of segments i. and ii. is not always shown, especially in smaller individuals.

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EXPLANATION OF PLATE IX.

Fig. 1. *Xenylla börneri*, Axels. Spring and tenaculum. Highly mag. (*a*) from below; (*b*) from the side.

Figs. 2 & 3. *Kalaphorura burmeisteri* (Lubb.).

Fig. 2. Apex of leg, × 280.
Fig. 3. Spring and tenaculum, × 310.

Figs. 4, 5, & 6. *Willemia anophthalma*, Börn. Highly mag.

Fig. 4. Postantennal organ. (*a*) in surface-view; (*b*) in optical section.

Figs. 7 & 8. *Isotoma delicatula*, sp. n.

Fig. 7. Eyes and postantennal organ, × 400.
Fig. 8. Apex of spring, × 280. (*a*) seen from inner side; (*b*) seen from above.

Figs. 9 & 10. *Sira platani* (Nic.).

Fig. 9. Animal seen from above, × 20.
Fig. 10. Apex of leg, × 340.

Figs. 11 & 12. *Orchesella terrestris*, sp. n., × 20.

Fig. 11. In side view.
Fig. 12. Seen from above.

XLVII.—*A new Species of* Camponotus *belonging to the Subgenus* Orthonotomyrmex, *Ashm.* (*Hymenoptera*). By C. Menozzi.

In a small collection of ants submitted to me by the British Museum I have found a characteristic new species of *Camponotus*, which is described below.

Camponotus (*Orthonotomyrmex*) *chalaconotus*, sp. n.

Worker major.—Head and antennæ black, thorax and scale dark ferruginous in colour, gaster brown, except anterior part of basal segment and a narrow band on the border of the other segments, which are of the same colour as coxæ; trochanters and femora yellow-testaceous, tibiæ and

Fig. 1.

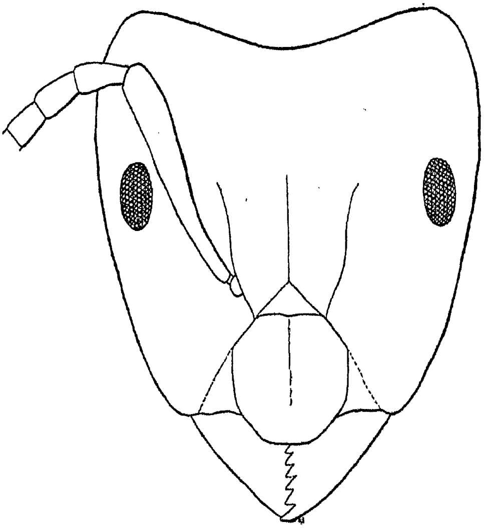
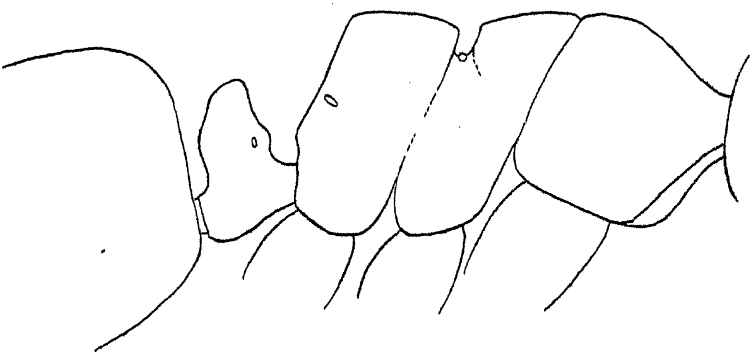


Fig. 2.



Camponotus (Orthonotomyrmex) chalaconotus, sp. n.
Fig. 1.—Front of head.
Fig. 2.—Side view of body.

tarsi more or less brown. Opaque; integument of head, thorax, and scale densely and lightly punctured, gaster finely transversely striate, scapes and legs almost entirely smooth and not very shining. Pubescence scanty, very fine, and adhering to the integument. Erect hairs, very numerous on the abdomen and thorax, especially on the latter, of a tawny colour and rather large; on the head they are limited by the occipital border and vertex; some others are present on the front, and the sides and anterior border of the clypeus; hairs arise from punctures somewhat larger than those which constitute the fundamental sculpture of the integument. The legs, especially the tibiæ and tarsi, bear erect hairs, shorter and considerably sparser than those of the body.

Head slightly longer than broad, its anterior portion somewhat narrow, with strongly rounded sides and broadly excised posterior border.

Mandibles smooth and shining, sparsely marked with large and small punctures; apical borders with six teeth.

Clypeus as long as broad, with anterior lobe rounded, projecting beyond anterior border of cheeks, and subcarinate longitudinally in middle.

Frontal area large and very distinct, united posteriorly to a frontal groove as long as frontal carinæ; latter rather distant from base and divergent behind. Antennæ stout and short; the scapes when bent back are about one-fifth of their length distant from the posterior corners of the head; joint 2 of funiculus evidently longer than the third; this and the following joints, except the last, a little longer than broad. Eyes situated distinctly behind middle of sides of head.

Thorax robust; pronotum broader than long, sides strongly rounded anteriorly, back longitudinally concave in middle, with two large round humeral gibbosities. Mesonotum separated from pronotum by a very well-marked suture, and above shaped like a trapezium, rounded posteriorly at the sides. Between this segment and the epinotum there is a large and deep interval, the surface of which is formed by the dorsal lamina of the mesonotum, on the sides of which are the respective spiracles. Epinotum with basal transverse face much longer behind than in front, the anterior border rounded and the posterior obliquely truncate, depressed in the middle, and with two distinct tubercular protuberances on each side; when seen in profile these stand out from the declivity of the epinotum at an obtuse angle.

Scale of petiole very thick, node-like in shape, and higher than long, its dorsal surface broader than long; in profile the superior border is obliquely truncate from front to rear, the anterior surface less high than the posterior, and strongly convex at base; posterior surface less apparently convex, but more so in the middle.

Legs rather short; second and third pairs with large truncate spurs and distinctly pectinate in shape.

Length 9·7 mm.

One specimen only, without any precise indication of locality, but most probably from India (or Burma), since it came from the collection of the late Col. C. T. Bingham.

Type in the collection of the British Museum.

Owing to the remarkable conformation of its thorax and scale, this new *Camponotus* is readily distinguishable from its congeners hitherto described. Its subgeneric position is somewhat dubious. I have assigned it provisionally to the subgenus *Orthonotomyrmex* on account of the shape of the epinotum, in which it somewhat resembles the species included therein,for instance *C. wasmanni*, Emery; but, before this can be definitely decided, considerably more material is needed.

Chiavari, April 1929.

XLVIII.—*Two new Species of* Actinolaimus *from South Africa.* By I. N. FILIPJEV.

(From the Osborn Zoological Laboratory, Yale University, New Haven, Conn., U.S.A.)

THE material described in the present paper was collected in freshwater plankton in S. Africa and received from Dr. and Mrs. G. E. Hutchinson, to whom the writer wishes to express his best thanks. No freshwater or marine Nematode is known to inhabit the plankton constantly, and it is highly probable that all such finds must be considered as accidental. The present material fully bears out this view; it consisted of a few individuals belonging to the genera *Ironus*, *Dorylaimus*, *Plectus*, and *Actinolaimus*; mature individuals were present in the latter genus only, and two species proved to be new.

The genus *Actinolaimus* was established by Cobb (1913) for several species with a highly differentiated vestibulum previously referred to *Dorylaimus*. The species of this genus seem to inhabit chiefly tropical countries, whence eight of the twelve known species have been described. This proportion is much more suggestive if we take into account the relatively backward condition of nematological research in tropical countries.

Some of the species referred to *Actinolaimus* are, perhaps, sufficiently distinct from the type-species to warrant their separation. *A. michaelseni*, Steiner, 1916, *A. cyatholaimus* (Daday, 1905), *A. tobleri*, Menzel-Micoletzky, 1925, have all a vestibulum with thin pliable walls, like a typical *Dorylaimus*; the reason for their inclusion in *Actinolaimus* is the presence of guiding onchi in the vestibulum. Possibly they should form a separate genus.

A distinctive character of species of true Actinolaimi is found in the shape of the spear. Thus, *A. rotundicauda* (de Man, 1880) and *A. tenuiaculeatus* (Kreis), Micoletzky, 1925, have a long and thin one, *A. labyrinthostoma* (Cobb, 1893), *A. macrolaimus* (de Man, 1880), *A. elaboratus* (Cobb, 1906), *A. propinquus*, Cobb, 1915, and *A. surinamensis*, Micoletzky, 1925, have one with medium characters, approximately one-third as thick as the hind part of the vestibulum; *A. tripapillatus* (Daday, 1905), *A. radiatus*, Cobb, 1913, and both the new species belong to the third group with a very broad spear, equal to nearly a half of the hind part of the vestibulum.

The description of *A. tripapillatus* and the drawings illustrating it give only a very feeble idea of its true organization, and a new description is very desirable. *A. radiatus* seems to have much thicker vestibular walls than either of the African species described below.

Actinolaimus africanus, sp. n. (Fig. 1, A–E.)

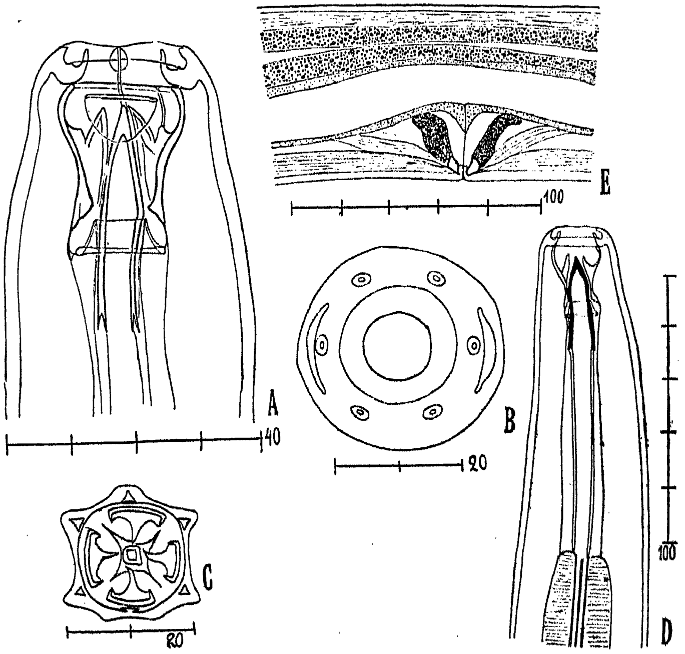
$$♀\ \begin{array}{ccccccccc} 33 & 125 & 245 & 1000 & 1160 & 1570 & 3170 & 4840 & 5360 \\ \hline 26 & & 59 & 70 & & 70 & & & 38 \end{array}\ 5780.$$

a, 83; *β*, 5·8; *γ*, 13·8; C, 11; A, 37; V, 27.

Body filiform; tail long, gradually narrowing to the acute end. Cuticle quite smooth and very transparent, measuring 3–4 μ throughout the body except in the tail, where it becomes gradually thinner, being finally less than 1 μ near the tip. Musculature strong, lateral cords 15 μ, nearly one-fifth of the body-diameter near the middle.

The head is rounded and very slightly constricted anteriorly (fig. 1, A). Around the mouth there are six very prominent papillæ, each situated in the middle of an oval area of thin cuticle. I am not sure if they represent labial or cephalic papillæ; but since they are not placed very closely around the mouth the second supposition is more probable (*cf.* fig. 1, A, B). The amphide has the form of a narrow transverse slit leading into the flat pocket behind; it is nearly 12 μ wide, 0·4 of the width of the neck.

Fig. 1.



Actinolaimus africanus, sp. n.

A. Head of female from the side (Bausch and Lomb, obj. 1½, oc. 10).
B. The same from in front, showing mouth, cephalic papillæ, and amphids; same magnification.
C. The same, deeper view, showing the spear and the four teeth in the vestibulum.
D. Fore part of the body, showing the anterior non-muscular part of the œsophagus with the enlarged inner tube (obj. 4, oc. 10).
E. Optical section of the vulvar part of the body (obj. 4, oc. 10).

The mouth-opening is circular and surrounded by a circular plicature of the exterior cuticle, which is separated by a groove from the sides of the head. The vestibulum has a thick chitinized wall, as in other species of the genus; this is thickest in its hind part, but the posterior side-walls are composed of thin, probably soft and pliable cuticle; the bottom itself is surrounded by a chitinized ring with a reduplication of soft cuticle in front of it around the spear advancing from behind. The inner surface of the vestibulum is complicated by a number of chitinized ridges and teeth pointing inwards. There are four such chitinous plates, each with two lateral ridges finishing at the base of the anterior widening of the vestibulum; one larger tooth arises from the middle of each plate and points forwards, all joining together in the middle of the vestibulum near the point of the spear when it is retracted. The spear is 36 μ long, its greatest width, 7 μ, being a little in front of its middle; the walls are thick and well chitinized. The vestibulum is unsymmetrical in its structure, which is bound up with the asymmetry of the spear itself, as in all other Dorylaiminæ; here the spear seems to be left subventral in position. The four chitinized plates of the vestibulum are ventral, dorsal, and lateral, but the dorsal and the right subventral are wider than the other two. The dorsal plate apparently corresponds to the dorsal sector of the œsophagus, the two lateral ones to the two subventral; the ventral plate gradually narrows behind and disappears between the subventral sectors.

The narrow portion of the œsophagus behind the vestibulum is completely devoid of musculature, consisting only of an epithelial layer around the strong cuticular tube; it measures here 15 μ in diameter, the tube being 7 μ. The musculature begins at 125 μ from the anterior extremity, the diameter here being 22 μ; the dorylaimoid expansion begins behind the nerve-ring and is very gradual, the maximal diameter, 44 μ, being reached near the hind end. The cardia is 35 μ long. The intestine was filled in its larger part by some transparent coagulated substance. The prærectum is 450 μ long, the rectum 70 μ.

The female genital organs are double, but the anterior ovary is much shorter than the posterior; both the branches of the uterus are, however, equal, perhaps because of the absence of the eggs inside. The slit-like vulva is surrounded (fig. 1, E) by thickenings of chitin around its walls; the vagina proper is composed of a thick clear substance (cuticular?) and widens internally; the clear substance is surrounded by a granular substance, probably glandular.

One female: Matsume Lake, near Masiyeni, S. Chopiland, Portuguese East Africa, 27. vi. 1928 (*Miss E. L. Stephens* leg.).

Actinolaimus hutchinsoni, sp. n. (Fig. 2, A–C.)

♂ $\dfrac{18\quad 63\quad 165\quad 590\qquad\qquad 1980\quad 2240}{18\qquad\quad 37\quad\ 41\quad\ 41\qquad\qquad\quad 36}$ 2260.

♀ $\dfrac{21\quad 65\quad 155\quad 585\quad 855\quad 1340\quad 1830\quad 1520\quad 1720}{16\qquad\quad 37\quad\ 46\qquad\qquad 48\qquad\qquad\qquad\qquad 22}$ 1950.

a, ♀ 41, ♂ 56 ; *β*, ♂ 3·8, ♀ 3·3 ; *γ*, ♂ 113, ♀ 8·5 ; C, ♂ 0·6, ♀ 10½ ; A 34–44 ; V 69.

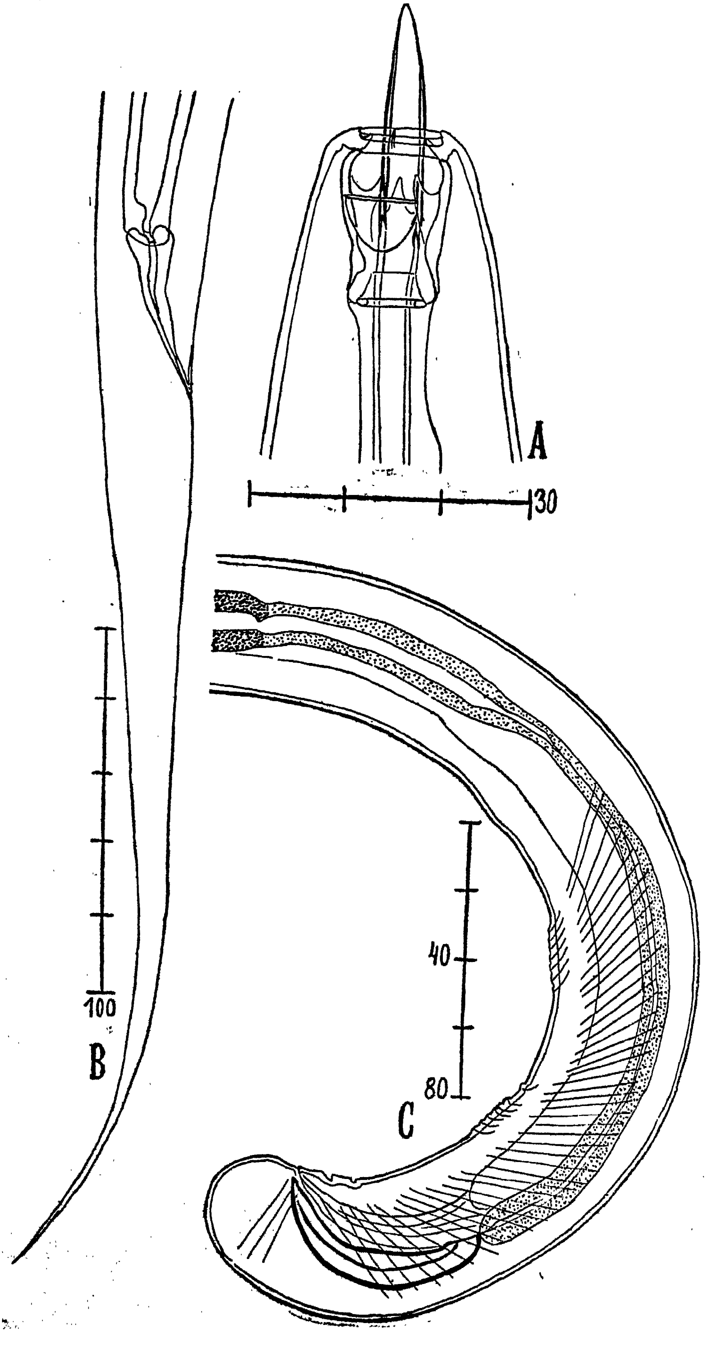
Body filiform ; tail in female long and gradually narrowing to the acute end, in male short and rounded. Cuticle smooth and transparent, 1½–2 *μ* thick, becoming gradually thinner on the tail ; lateral cords 12–13 *μ*, about one-fourth of the diameter of the body in its middle.

The head is rounded and not separated by any constriction (fig. 2, A). The six cephalic (?) papillæ are disposed as in the preceding species, but are less developed ; I was not able to see any tubercles of thin cuticle around them. The amphids are of the same shape as in the preceding species, but are situated a little farther back, against the vestibular tooth ; the amphidal slit has a breadth of only 8 *μ*, a little more than 0·4 of the diameter of the neck.

The structure of the mouth is as in the preceding species, but the cuticular folds and the circular groove are much weaker. The walls of the vestibulum are thinner ; the tooth is smaller, only 18 *μ* long, about half of its length in the preceding species. The spear is 25 *μ* long and 4 *μ* wide, its walls are not thick. I could not see the head from in front, so that I have no notes about its asymmetry. The vestibulum is succeeded by a very narrow portion of the œsophagus, the thin layer around the cuticular tube is only 2 *μ* thick, the tube itself measuring 4 *μ* ; against the back part of the tube the œsophagus widens till it measures 12 *μ*, being always devoid of musculature ; the last begins only at 65 *μ* from the head ; the œsophagus is here 18–20 *μ* wide, and expands gradually, reaching 30 *μ* near the hind end. The cardia is long (33 *μ*), as in other related forms ; the rectum is 40–45 *μ* ong.

The spiculæ are curved, as in other Dorylaiminæ, and 45 *μ* long. Two papillæ are situated just in front of the anus ; two other groups of closely aggregated papillæ, six to seven in number, are separated from each other by a distance of 35–40 *μ* ; the same distance intervenes between the hinder of these two and the preanal group ; a smooth elevation of the cuticle is to be seen nearly at the same distance in front

Fig. 2.



EXPLANATION OF FIG. 2.

Actinolaimus hutchinsoni, sp. n.

A. Head of female (Bausch and Lomb, obj. 1½, oc. 10).
B. Tail of female (obj. 4, oc. 10).
C. Tail of male (obj. 4, oc. 10).

of the anterior group. The bursal musculature is strong, consisting of about forty-five fibres.

The female genital organs are double and symmetrical, both the ovaries being of the same length. The vulva is situated near the middle of the body; it bears the same cuticular thickenings near its border as in the foregoing species; the vagina has also the same shape.

Freshwater pan, Weltevreden West, Lake Chrissie area, Transvaal, 8. vii. 1928 (*Dr. and Mrs. G. E. Hutchinson* leg.); 1 ♂, 1 ♀, 1 ♂ j., 2 j.

Rietfontein pan, near Johannesburg, Transvaal, S. Africa (*Mr. and Mrs. G. E. Hutchinson* leg.); 2 ♀, 2 ♂, all moulting.

This species is very near to the foregoing one, but differs by its smaller dimensions and the symmetrical female genital organs, besides several particularities of structure in the head and vestibulum.

Yale University, New Haven, Conn.,
December 1928.

XLIX.—*Some Results of a Journey to Kaieteur Falls, British Guiana.* By T. D. A. COCKERELL, University of Colorado.

IN May and June 1929 Miss Alice Mackie visited British Guiana, and took occasion to make a trip to the Kaieteur Falls, accompanied by Mr. and Mrs. Ogilvie. Miss Mackie writes:—"We went in the rainy season, which from the spectacular point of view is the right time, as the Falls are at their best; but for days on end we were soaked to the skin, and could not get a change of dry clothing, and the mosquitoes and sand-flies and bête-rouge nearly drove me frantic. The heat was not as trying as I expected, though at times it was like being in one of the green-houses at Kew—especially on the last day, when we had to climb a mountain like the side of a house. The scenery was marvellous, and what delighted us more than anything was the wild flowers on the Kaieteur plateau. Here we found a tropical alpine garden, and some most beautiful orchids—a great variety of them, but mostly ground-orchids. One in particular, like a tall white and golden lily, was a glorious sight. The vegetation was very interesting, and the jungle scenery on the rivers magnificent. We had a negro cook with us, and some aboriginal Indians as carriers. Most interesting people, small but strong and well shaped, and always ready to laugh, like our Siamese carriers. Their clothing consisted only of a scarlet loin-cloth, and a peculiar and favourite ornament was several pins (the ordinary household variety) projecting through a hole in the lower lip, like the spines of a hedgehog! They are great hunters, and from the boat one of them shot a 'red howler,' which was looking at us from a tree on the river bank. I do not know the scientific name of these monkeys, but they are the ones which roar like a lion —an awesome sound when you hear it at dawn in the jungle."

The collections made include many species of interest, and I refer here only to a certain number which it has been practicable to work up at the present time.

MOLLUSCA.

Bulimulidæ.

Auris (*Eudolichotis*) *glabra aliceæ*, subsp. n.

Shell fusiform, rather thin, shaped nearly as fig. 36, pl. xli. of Pilsbry (Man. Conch. ser. 2, vol. x.), but with the spire somewhat more swollen and less acute. The sculpture is typical for *A. glabra* as described by Pilsbry, but the shell is pale horn-colour, the apex concolorous, the last whorl and half the penultimate one with widely spaced, somewhat oblique, dull cream-coloured longitudinal stripes, more or less angular and often broken above the periphery. About the middle of the last whorl the stripes are about 2 mm. wide and the intervals about 4 mm. Upper lip below the shoulder straight, with a very faint inward curve; lip white, the outer one strongly reflexed, but the columellar region within and the region above the columellar fold pale chocolate.

Long. 35·5 mm.; lat. 11; aperture, long. 18, width at middle 6, width near lower end 4·5.

Between Tukeit and the Kaieteur Falls, May 27 (*Alice Mackie*).

To my surprise this is not like any of the species recorded from Venezuela (*cf.* H. B. Baker, Occ. Papers Mus. Zool., Univ. of Michigan, no. 167, 1926), but very closely resembles *A. glabra* (Gmelin), from the islands of Trinidad and Tobago. As compared with typical *A. glabra*, as figured by Pilsbry, the pattern is reversed, with pale stripes on a dark ground, instead of dark stripes on a pale ground. It must be regarded as a mainland form of *A. glabra*, apparently subspecifically distinct. I do not possess Gmelin's work, but Turton's edition of Linnæus (1806) states that the locality of what was then called *Voluta glabra* is unknown, that the length is near 2 inches (much larger than the shell now described), and that there are "perpendicular waved yellowish or chestnut stripes."

INSECTA.

LEPIDOPTERA.

Syntomidæ.

Hyda basilutea, Walker.

Rockstone, May 21 (*J. Ogilvie*).

This beautiful little moth is recorded from Colombia and Brazil, but I find no record for British Guiana.

HYMENOPTERA.

APOIDEA.

Bombus cajennensis (Fab.).

Waratuk, May 24 (*J. Ogilvie*).

This is *B. incarum*, Franklin. I have the same from Manaos, Brazil.

Eulæma dimidiata (Fab.).

Amatuk, May 24 (*J. Ogilvie*); Rockstone, June 2 (*J. Ogilvie*).

Euglossa charapensis, Cockerell.

Female (typical coloration, with apex of abdomen copper-red), Kaieteur, May 25 (*A. Mackie*); both sexes (the female with abdomen all green, the male with apex suffused with golden), Amatuk, May 24 (*J. Ogilvie*).

The female is known from the common *E. cordata* (L.) by the large black tuft on the scutellum. The male is new; it is remarkable for the shining, polished, thoracic dorsum, which appears to ally it with *E. variabilis*, Friese, but the scape is broadly white in front and the scutellum is convex, with a deep median sulcus. The species was described from the Rio Charape, Peru. Miss Mackie writes:—"They are quite gorgeous in the sun with their vivid metallic colouring."

Centris personata, Smith.

Two females, Waratuk, May 24 (*J. Ogilvie*).

Xylocopa brasilianorum (L.).

Female, Kaieteur, May 25 (*J. Ogilvie*).

Xylocopa medionitens, Cockerell.

Two females, Kaieteur, May 26 (*J. Ogilvie*), and May 27 (*A. Mackie*).

Described from French Guiana.

Xylocopa frontalis fabricii, Cockerell.

Female, Kaieteur, May 26 (*A. Mackie*).

Described from French Guiana, Surinam, and Brazil.

Ancyloseeles armata (Smith).

Male, Tumatumari, May 23 (*A. Mackie*).

Chalepogenus xanthaspis, sp. n.

♂.—Length about 7·6 mm., anterior wing 8 mm.

Facial quadrangle much longer than broad, orbits converging below; eyes black; mandibles (except black tips), labrum (except three brown spots at base), clypeus (except a pair of brown marginal stripes above and a pale reddish suffusion in middle), supraclypeal area, lateral face-marks (extending as broad bands some distance above level of antennæ), frontal stripe (linear above, broad and claviform below), and stripes along posterior orbits extending to sides of occiput all pale yellow; clypeus and supraclypeal area with scattered strong punctures; front, vertex, and cheeks (with thin white hair) black, the front highly polished, with scattered punctures; scape broadly yellow in front, pale reddish behind; flagellum light ferruginous beneath, dark above; fourth antennal joint broader than long, much shorter than third or fifth; thorax mainly light yellow, but mesopleura except anteriorly and below light reddish, metathorax except enclosure pale reddish, and mesothorax with the dull (very minutely and densely punctured) disc black, on which are two yellow lines, a little curved, with the convexity mesad; at each side of mesothorax is a broad band of yellow, suddenly widened at level of tegulæ; tegulæ light ferruginous, with a yellow spot. Wings long, strongly suffused with orange, faintly dusky apically, stigma and nervures clear ferruginous; basal nervure meeting nervulus; first recurrent joining second cubital cell at about the beginning of apical third; second recurrent ending about as far from end of third cubital cell as first from end of second. Legs pale ferruginous, with mainly pale reddish hair, but hind basitarsi more dusky, with a dense brush of long black hair posteriorly; claws with apical half black. Abdomen highly polished, brown, pale reddish apically, first two tergites testaceous except the broad brown hind margin, third and fourth testaceous at extreme (concealed) base.

Amatuk, May 24 (*J. Ogilvie*).

Its affinities are best shown by the following table:—

	Yellow; the mesothorax not black, but front brown-black, with a median yellow stripe. (Ega, Brazil.)	*flavipennis* (Smith).
	Greater part of mesothorax (at least) black ..	1.
1.	Mesothorax black, without yellow stripes. (Brazil.)	*michaelis* (Friese).
	Mesothorax with two yellow stripes	2.
2.	Smaller (6 mm.); scopa of hind legs red. (Panama.)	*globulosus* (Friese).
	Larger (7·6 mm.); hind legs with a dense fringe of black hair on basitarsi. (British Guiana.)	*xanthaspis*, Ckll.

Nomada dolichoglossa, sp. n.

♂.—Length about 8 mm., anterior wing 7 mm.

Entirely ferruginous, shining, the front darker red and dull; mandibles bidentate, the apical part black; tongue very long (about 4·3 mm.); maxillary palpi small and slender; sides of face with appressed pale hair; clypeus and supraclypeal area with strong irregular punctures; a smooth polished space at each side of ocelli; antennæ ferruginous, the flagellum dusky above; third antennal joint short, longer than fourth on inner side, but conspicuously shorter on outer; last joint with a dorsal suture, so that from above the antennæ appear 14-jointed; prothorax above swollen and shining at each side; mesothorax and scutellum shining, inconspicuously punctured, with sparse red hair; scutellum convex, not at all bigibbous; area of metathorax polished, with a median pit; tegulæ shining ferruginous. Wings yellowish, dusky apically; stigma large, clear ferruginous, nervures fuscous;

basal nervure meeting nervulus; marginal cell large, pointed on costa; second cubital cell very large, square, receiving recurrent nervure about the middle; third cubital cell about as broad as second, but greatly narrowed above, the outer intercubitus angulate; second recurrent received scarcely beyond middle of third cubital cell. Legs with red hair, hind basitarsi large and swollen. Abdomen polished, more or less infuscated at sides, and with broad dusky apical bands on third and fourth tergites; apical plate truncate.

Kaieteur, May 23 (*A. Mackie*).

A remarkable species, perhaps forming a distinct subgenus. On account of the mandibles it falls with the subgenus *Gnathias*, but it is not much like the typical members of that group.

L.—*The* Formicidæ (*Hymenoptera*) *taken by Major R. W. G. Hingston, M.C., I.M.S. (ret.), on the Mount Everest Expedition,* 1924. By HORACE DONISTHORPE, F.Z.S., F.E.S., &c.

THE following list of ants taken by Major Hingston on this expedition includes the names of twenty-two species, of which four are new to science. There are six species of Ponerinæ, one Doryline, six Myrmicinæ, and nine Formicinæ. In the Formicinæ two species—*Formica exsecta*, Nyl., and *Formica picea*, Nyl.—are found in Britain. Perhaps the most interesting of the four new species is *Acanthomyops* (*Chthonolasius*) *hingstoni*, which I have named in honour of its discoverer. Most of the species are well-known Indian insects. According to Major Hingston, the ants found at the higher elevations are exceedingly lethargic and sluggish in their movements.

PONERINÆ.

1. *Lobopelta diminuata*, Smith.

11 ☿ ☿, Sikhim, Rongli Chu, 3000 ft., 29. iii. 24.

2. *Odontoponera transversa*, Smith.

1 ☿, Sikhim, Rongli Chu, 3000 ft., 29. iii. 24.

3. *Diacamma sculptum*, Jerd.

6 ☿ ☿, Sikhim, Kalimpong, 4000 ft., 27. iii. 24; 3 ☿ ☿, Sikhim, Gantok, 5000 ft., 5. iv. 24.

4. *Ectomyrmex javanus*, Mayr.

7 ☿ ☿, Sikhim, Kalimpong, 4000 ft., 27. iii. 24; 2 ☿ ☿, Sikhim, Pedong, 6000 ft., 28. iii. 24.

5. *Bothroponera rufipes*, Jerd.

1 ☿, Sikhim, Rongli Chu, 3000 ft., 29. iii. 24; 4 ☿ ☿, Sikhim, Singhik, 4000 ft., 23. iv. 24.

6. *Brachyponera nigrita*, Emery.

6 ☿ ☿, N. India, Darjeeling, 7000 ft., 1–10. iii. 24.

DORYLINÆ.

7. *Dorylus orientalis*, West.

20 ☿ ☿, N. India, Darjeeling, 5000 ft., 11–20. iii. 24.

MYRMICINÆ.

8. *Pheidole latinoda*, Roger.

2 ♃ ♃, N. India, Darjeeling, 5000 ft., 14. iii. 24.

9. *Pheidole jucunda*, Forel.

11 specimens, ♃ ♃ and ☿ ☿, N. India, Darjeeling, 5000 ft., 14. iii. 24.

10. *Myrmica rugosa*, Mayr.

15 ☿ ☿, N. India, Darjeeling, 7000 ft., 1–10. iii. 24.

11. *Myrmica everesti*, sp. n.

☿. Dark brown, head and gaster except apex almost black, coxæ, mandibles, articulations of the legs and antennæ, and apex of gaster reddish. Body furnished with sparse, scattered, yellow hairs.

Head strongly longitudinally striate, temples and occiput reticulated; *mandibles* longitudinally striate, masticatory margin with terminal tooth long and curved, second tooth shorter but distinct, the rest indistinct; *clypeus* with anterior border produced and pointed, entirely longitudinally striate; *frontal area* smooth and shining; *scape of antennæ* reaching beyond posterior margin of head, *funiculus* with a distinctly 4-jointed club. *Thorax* strongly reticulate, longitudinally striate at sides; *epinotal spines* very short, sharply pointed, very slightly curved inwards, very shining between the spines, but distinctly though finely transversely striate. *First node of pedicle* rugosely punctured above, longitudinally striate at sides, with a distinct tooth or spine projecting forward at its base beneath; *second node* rugosely longitudinally striate, broader but shorter than first node, rounded at sides, with a very blunt projection at its base beneath. *Gaster* oval, very shining; *sting* strong.

Long. 4·5–5 mm.

This species comes near to *M. smythiesi*, Forel, but is darker and slightly more robust; the antennæ are shorter and stouter, the spines shorter and more curved. The spines are about the same length as those of *M. tibetana*, Mayr, but are broader at the base and more curved. The whole of the insect is much more rugose than *tibetana*, the space between the spines being smooth in the latter.

Described from five ☿ ☿ taken by Major R. W. G. Hingston at Jelap La (Tibetan side), at a height of 12,000 ft., on April 1st, 1924 (Everest Expedition).

Type and paratypes in the British Museum Collection.

12. *Myrmica specularis*, sp. n.

☿. Red-brown, head and gaster black, apices of mandibles, articulations of legs and antennæ, base of thorax including the epinotal spines and the space between, the nodes anteriorly and posteriorly reddish; covered with stiff scattered white bristles.

Head somewhat square, rounded behind, *front* longitudinally striate with a few cross-striæ, *temples, cheeks,* and *occiput* rather strongly reticulate; *mandibles* longitudinally striate, with several transverse striæ towards the apex; *clypeus* convex, rounded in front, both longitudinally and transversely striate; *frontal area* smooth and shining; *scape of antennæ* evenly curved at base, *funiculus* with 4-jointed club.

Thorax strongly reticulate, longitudinally striate at sides; *spines* long, strong, and sharply pointed, pointing backwards, but slightly curved downwards, space between smooth and shining. *First node of pedicel* high, with a strong tooth beneath pointing forwards, punctured and somewhat reticulate above; *second node* shorter and in profile not so high as first node, slightly less punctured, with somewhat deep longitudinal pits. *Gaster* smooth and very shining.

Long. 6–6·5 mm.

The spines are more divergent than in *M. rugosa*, Mayr, the apex of the clypeus is not pointed, the nodes of the pedicel are broader and not so closely sculptured, and the insect is not so dark in colour.

From *M. ruginodis*, Nyl., the present species differs in its much darker colour and more robust form, and in the space between the spines being smooth. The head is much more strongly reticulated, the body generally is more coarsely sculptured, and the bristles are stronger, longer, and more numerous.

Described from eight ☿ ☿ taken by Major R. W. G. Hingston in Tibet, Gautsa, at a height of 13,000 ft., on April 5th, 1924 (Everest Expedition). There are also ten specimens in the British Museum Collection taken at Khamba Jong, Sikhim, 15–30. vii. 03, at a height of 15,000–16,000 ft. (Tibet Expedition, 1903), which agree quite well with the above species with the exception of being not quite so dark.

Type and paratypes in the British Museum Collection.

13. *Aphænogaster tibetana*, sp. n.

☿. Black, shining, covered with scattered yellowish-white bristles.

Head and *thorax* longitudinally striate and reticulate, but smooth, not shagreened between the raised lines. *Mandibles* longitudinally striate and punctured, masticatory margin armed with nine teeth, the terminal tooth being large, the second and fourth moderate, the third small, and the rest very small; anterior border of *clypeus* emarginate in middle, longitudinally striate at sides, and smooth in middle; *frontal area* and *antennal hollows* smooth. *Epinotal spines* short, sharp, and pointing outwards, space between the spines smooth. *Nodes of pedicel* and *gaster* smooth and shining.

Long. 5 mm.

Described from 17 ☿ ☿ taken by Major R. W. G. Hingston in Tibet, Kampa Dzong, at a height of 14,500 ft., on April 30th, 1924, and 27 ☿ ☿ taken in Tibet, Tasam Rongshar Valley, at a height of 12,000 ft., on June 20th, 1924.

Type and paratypes in the British Museum Collection.

FORMICINÆ.

14. *Formica exsecta*, Nyl.

22 ☿ ☿, Tibet, Shekhar, 14,500 ft., 8. vii. 24.

15. *Formica picea*, Nyl.

1 del. ♀, 24 ☿ ☿, Tibet, Yatung, 10,000 ft., 1–3. iv. 24.

16. *Acanthomyops* (*Chthonolasius*) *hingstoni*, sp. n.

(See below.)

17. *Camponotus paria*, Emery.

1 ♃, 2 ☿ ☿, Sikhim, Kalimpong, 4000 ft., 27. iii. 24.

18. *Camponotus badius*, Smith.

30 ♃ ♃ and ☿ ☿, N. India, Darjeeling, 5000 ft., 11–20. iii. 24.

19. *Camponotus nicobarensis*, Mayr.

1 ♃, Sikhim, Kalimpong, 4000 ft., 26. iii. 24.

20. *Camponotus wasmanni*, Emery.

1 ☿, Sikhim, Kalimpong, 4000 ft., 27. iv. 24.

21. *Polyrhachis dives*, Smith.

1 ☿, Sikhim, Kalimpong, 4000 ft., 27. iii. 24.

22. *Polyrhachis mayri*, Roye.

1 ☿, Sikhim, Kalimpong, 4000 ft., 26. iii. 24; 4 ☿ ☿, Sikhim, Gantok, 5000 ft., 3. iv. 24; 4 ☿ ☿, Sikhim, Singhik 4000 ft., 23. iv. 24.

Acanthomyops (*Chthonolasius*) *hingstoni*, sp. n.

☿. Reddish yellow, mandibles redder, teeth of mandibles and eyes black; whole body finely shagreened but shining, furnished with scattered, long, yellow hairs, and covered with fine, short, decumbent, yellow pubescence.

Head square, sides straight, posterior border straight when seen from front, slightly excavate when seen from behind; *mandibles* massive, finely striate, masticatory margin furnished with eight blunt teeth; *clypeus* ample, convex, subcarinate, slightly longer than broad, anterior border somewhat rounded in centre, and slightly crenulate; *frontal area* conspicuous though indistinctly defined; *ocelli* distinct; *frontal furrow* well marked, reaching median ocellus; *eyes* normal; *frontal carinæ* well marked; *antennæ* long, *scape* slightly curved at base, when bent back reaching beyond margin of head by nearly half its length, *funiculus* gradually thickened to apex, with all the joints longer than broad; *maxillary palpi* only 5-jointed (joints 5 and 6 evidently fused together); *labial palpi* 4-jointed.

Thorax broad; *prothorax* ample, rounded; *meso-epinotal furrow* well marked; *epinotum* rounded above, as high as mesonotum when seen in profile, basal declivity abruptly slanting, somewhat concave. *Scale* high, longer than broad, oval, pointed at apex, narrow at apex when viewed in profile, posterior surface straight, anterior surface slightly concave.

Gaster ample, rounded. *Legs* long, *femora* and *tibiæ*, especially posterior ones, compressed, *tibiæ* without outstanding hairs.

Long. 6–6·5 mm.; all nearly uniform in size.

This species comes nearest to *A.* (*C.*) *umbratus*, Nyl., from which it differs in being somewhat larger and in not possessing outstanding hairs on the tibiæ, in the scale being pointed at the apex and not slightly excavate, and in having 5-jointed instead of 6-jointed maxillary palpi (in which it differs from all the rest of the genus). The colour is more reddish yellow, and the hairs on the body are distinctly longer and more abundant.

Described from sixteen ☿ ☿ taken by Major R. W. G. Hingston at Darjeeling, N. India, at a height of 5000 ft., on March 14th, 1924 (Everest Expedition).

Type and paratypes in the British Museum Collection.

LI.—*A new Opisthoglyphous Snake from West Africa.*

By H. W. Parker, B.A.

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In the literature dealing with African herpetology there are several records of the species *Rhamphiophis oxyrhynchus* (Reinh.) from Dahomey. Both Werner and Sternfield have pointed out that these West African specimens differed in colour from examples from East Africa, but it has remained for Dr. A. Connal of the Medical Institute of Lagos to call the author's attention to certain structural differences which suggested that the East and West African Sharp-nosed Snakes were distinct.

Comparison of a series of fifteen specimens from various localities in E. Africa with six from W. Africa shows these differences to be constant, and, since no intermediates are known and the two forms appear to be widely separated geographically, it seems reasonable to regard them as separate species.

Rhamphiophis connali, sp. n.

Rhamphiophis oxyrhynchus, Werner, Verh. zool.-bot. Ges. Wien, 1899, p. 147; Arch. f. Naturg. A. 12, 1925, p. 136 (part.). Sternfeld, Mitt. Zool. Mus. Berlin, iv. 1, 1908, p. 217; Fauna d. Deutsch. Kolon. ii. 1, 1909, p. 19. Boulenger, Proc. Zool. Soc. London, 1919, p. 289 (1920) (part.).

Type-specimen a male, number 1914. 12. 24. 2 in the British Museum, from Accra, Gold Coast; collected by Dr. Scott Macfie.

Snout obtusely pointed, with sharp, angular, horizontal edge; hooked in profile. Upper portion of rostral as long as its distance from the frontral; lower surface deeply excavated. Internasals about as long as broad, slightly shorter than the præfrontals; frontal once and a half as long as broad, shorter than its distance from the end of the snout but a little longer than the parietals; loreal a little deeper than long; a single præocular, partially divided beneath the canthus rostralis which is scarcely projecting; præocular almost flat, not reaching the frontal; two postoculars; temporals 1+3; eight upper labials, the fourth and fifth entering the eye; five lower labials in contact with the anterior chin-shields, which are longer than the posterior. Scales smooth, with apical pits; seventeen rows at mid-body, reduced to fifteen at the vent and increasing to twenty-three on the neck. Ventrals 174; anal divided; subcaudals 90+1.

Olive-brown above, some of the lateral scales with horizontal lighter streaks along their upper and lower borders. Head rufous-brown. Lower surfaces yellowish white.

Length from snout to vent 760 mm.; tail 300 mm.

The five paratypes exhibit some variations. The rostral may be shorter than its distance from the frontal, the internasals broader than long, the frontal shorter than its distance from the end of the snout, temporals 2+3 or 2+4, præocular without any trace of cleft and four lower labials in contact with the anterior chin-shields. In juvenile examples some of the scales have darker edges, producing a faint dark etching on the brownish-grey ground-colour.

The scale-counts are as follows:—

Ilorin (female)	Ventrals	194;	subcaudals	106+1.
„ (juvenile)	„	196;	„	100+1.
Lagos (hgr.)	„	179;	„	93+1.
Slave Coast (juv.)	„	187;	„	99+1.
"N. Nigeria" (juv.)	„	183;	„	101+1.

The largest recorded specimen is that mentioned by

Werner * with a head and body length of 920 mm. and a tail of 200 mm. This specimen also has the lowest number of ventrals (170), but the very low subcaudal count (56+1), together with the fact that the tail measures less than a quarter of the head and body, suggests that this organ has been injured; in the other specimens it is not, or but slightly, less than one-third of this distance. Nieden's † record of nineteen scale-rows for the species is probably an error.

In specimens of true *R. oxyrhynchus* the relative proportions of the frontal, parietals, and loreal, which would appear from the published descriptions to provide good differential characters, are variable; nevertheless, there are certain differences which appear to be quite constant. In *R. oxyrhynchus* there are at least two, usually three, præoculars, and the canthal edge is strongly projecting just in front of the eye; in *R. connali* the præocular is never completely divided ‡ and the canthal edge scarcely prominent. The posterior chin-shields of *oxyrhynchus* are always as long as or longer than the anterior, whereas in *connali* they are constantly slightly shorter. In the former species the number of scale-rows is reduced to thirteen a considerable distance in front of the vent, but in the one here described the number is never reduced below fifteen; finally, *connali* lacks all trace of the black bar through the eye which is so characteristic of the East African species. The geographical ranges of the two species do not, so far as is known, overlap; *oxyrhynchus* ranges from Somaliland and Abyssinia to Tanganyika Territory and Nyassaland, but does not appear to have been recorded hitherto from the west of the Great Rift Valley; *connali* is known from the Gold Coast, Dahomey, and Nigeria.

LII.—*Two new Nematode Bird Parasites from Central Asia.*

By E. A. Spaul, B.Sc., Ph.D., Birkbeck College, University of London.

The following is an account of some Nematodes collected by Dr. H. A. Baylis from the cæca of *Tetraogallus tibetanus*, a large grouse-like bird from Central Asia. The birds, which were said to have come from the Altai Mountains, had been imported into this country in cold storage, and the worms were found to be still in quite a good state of preservation. They proved, on examination, to represent two new species belonging to the genera *Subulura* and *Heterakis* respectively.

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* Werner, Verh. zool.-bot. Ges. Wien, 1899, p. 147.

† Nieden, Fauna deutsch. Kolon. ii. 1, 1909, p. 19.

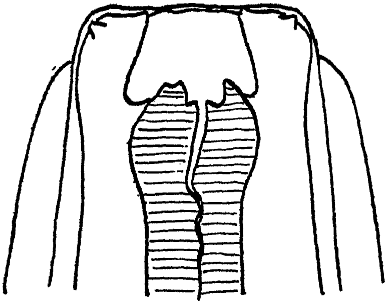
‡ Werner, *loc. cit.*, records two præoculars, but probably it will be found that the suture is incomplete.

Subulura tetraogalli, sp. n. (Figs. 1–3.)

The measurements of two females and one male are given in the accompanying table (p. 459). These specimens, together with a third female having dimensions almost identical with those of the smaller female, formed the collection obtained of this genus.

The body is fairly uniform in thickness, tapering slightly anteriorly to a blunt head and posteriorly to form an acutely pointed tail. The cuticle and lateral alæ have fine transverse striations, and the latter are present throughout the length to the anal region at approximately the same width.

Fig. 1.



Subulura tetraogalli, sp. n. Female head.

There are no pronounced lips. Six small cephalic papillæ just behind the mouth were observed with difficulty. The œsophagus is club-shaped and followed by a large bulb. It has three small inconspicuous teeth at its entrance at the base of the buccal cavity.

The nerve-ring appears to be a short distance from the entrance to the œsophagus and the excretory pore just behind, but their positions were difficult to determine with any certainty.

In the male the tail is recurved, with a pronounced terminal spike. The slight caudal alæ extend from the most anterior papillæ to the base of the spike. The lateral alæ originate at the level of the entrance to the œsophagus, and extend to a point just anterior to the sucker. The elongate oval preanal sucker is not prominent, and is situated with its mid-point approximately level with the most anterior pair of papillæ. The spicules are equal, curved, slender, ending sharply posteriorly, but otherwise of uniform thickness. The gubernaculum is dorsal to the spicules, wedge-shaped, with pointed end at the anus, and a hollowed surface towards the spicules. There are six preanal and six postanal pairs of papillæ. The first and second pairs of preanal papillæ are prominent flat-headed processes, the first level with the preanal sucker, the second midway between the sucker and the gubernaculum, the third pair small and rounded alongside the gubernaculum near its anterior end and seen with difficulty, the fourth larger and rounded near the anus, the fifth and sixth large, prominent, finger-like processes close together and lateral to the anterior edge of the anus. The first postanal pair are median, stout, but short rounded processes immediately behind the posterior lip of the anus, the second more lateral and like the remainder slender and with a rounded head. The papillæ decrease in size towards the terminal spike. About the same interval separates the first four postanal pairs, but that between the fourth and fifth is much smaller, whilst the fifth and sixth are close together at the base of the spike.

In the female the lateral alæ arise at the level of the middle of the buccal cavity, and hence in advance of those of the male. The tail is long, straight, and pointed. The vulva is anterior to the middle of the body. The eggs are oval, thin-shelled, containing embryos when laid.

A large number of species of *Subulura* have been described from birds. The recent monograph by Cram (1927) mentions over thirty. The features serving to distinguish the present species, which has no outstanding or special character, from the other members of the genus possessing equal spicules are (1) the extent of the lateral and caudal alæ, (2) the number and distribution of the papillæ, (3) the ratios of the tail and œsophagus to the length. The size of the spicules in relation to the length, the size and shape of the gubernaculum, the position and size of the preanal sucker and the position of the vulva and size of the eggs, together with dimensional differences in conjunction with these features emphasize still more the difference between this species and others of the genus.

Fig. 2.

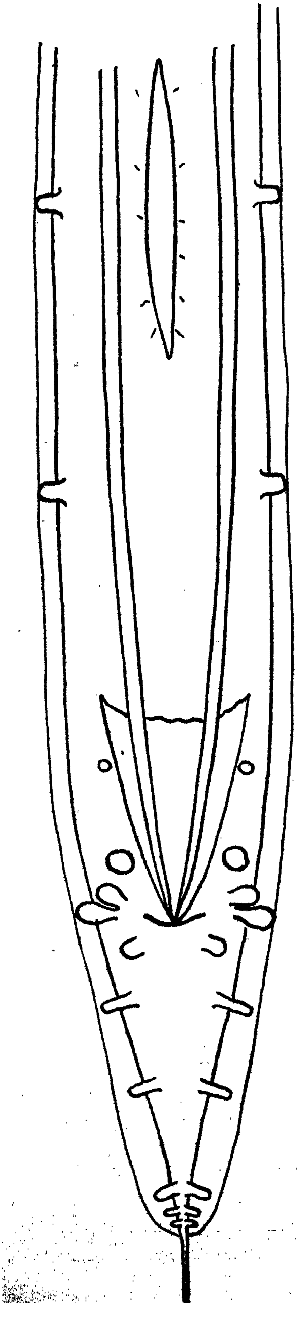
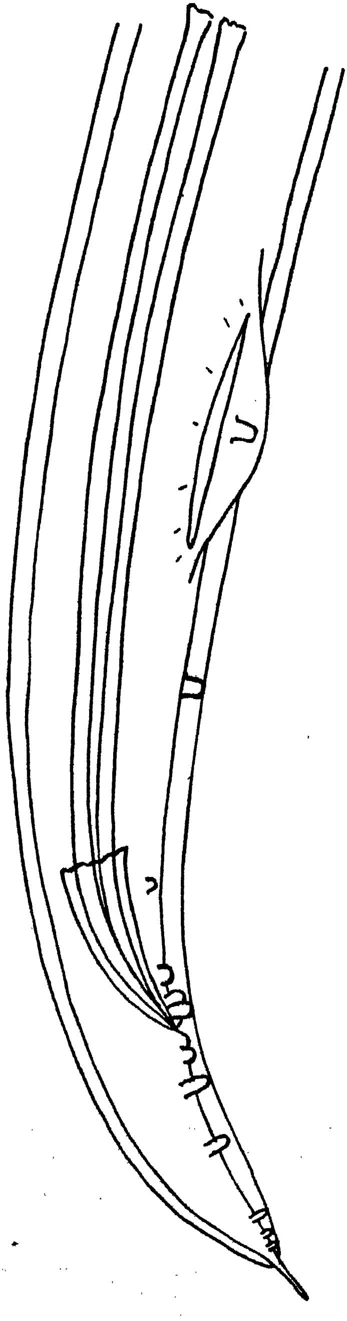


Fig. 3.



EXPLANATION OF FIGS. 2 & 3.

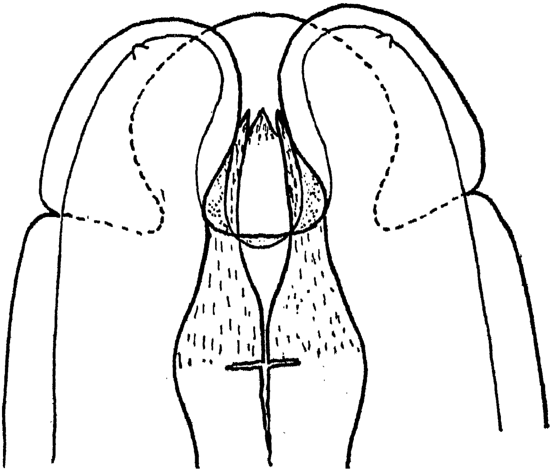
Subulura tetraogalli, sp. n.

Fig. 2.—Male tail, ventral view.
Fig. 3.—Ditto, lateral view.

Heterakis altaica, sp. n. (Figs. 4–8.)

The remaining twenty-six worms—nine males and seventeen females—of the collection belonged to this species. Only small variations in the dimensions of the specimens of the same sex were noted. The average measurements of each sex are tabulated (p. 460).

Fig. 4.



Heterakis altaica, sp. n. Female head.

The body tapers slightly anteriorly and ends in a pointed tail. The lateral alæ are narrow and extend from the base of the lips to the anal region, becoming somewhat narrower posteriorly. There are three pronounced semicircular lips each bearing two minute papillæ and having their edges hollowed out at the base. A triangular internal thickening is present inside each lip, and appears to be a cuticular extension of the œsophageal wall. At the anterior limit of each extension there is a minute tooth-like projection. The œsophagus can be divided into two regions—a small anterior portion or pharynx, followed by a club-shaped posterior part (the œsophagus proper), which appears to be more muscular. The pharynx gradually increases in width, and its junction with the succeeding portion is marked by a slight swelling, but a gradual progressive increase in width follows in the posterior portion until the rapid widening to form the bulb occurs. The lumen is wide at the entrance, narrowing to a small canal which has lateral extensions in the plane separating the pharynx from the œsophagus proper. The intestine is narrower at its origin than the œsophagus. The position of the excretory pore and nerve-ring were difficult to determine.

Fig. 5.

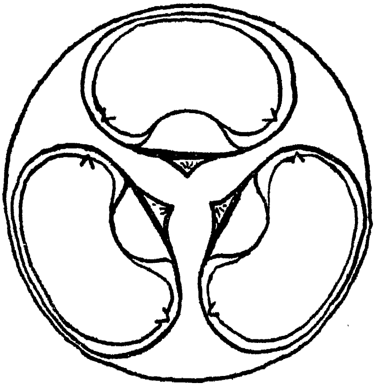
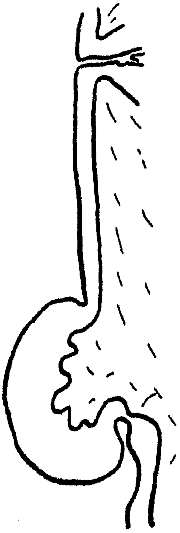


Fig. 6.



Heterakis altaica, sp. n.

Fig. 5.—Lips.
Fig. 6.—Vulva and cuticular projections.

In the male the tail is straight, ending in a long spike. There is a large, prominent, well-developed preanal sucker with strongly chitinized walls and a median papilla on its posterior border. The lateral alæ terminate anteriorly to the sucker, but caudal alæ arise and extend to the base of the tail-spike. The spicules are equal, with blunt anterior and pointed, recurved, posterior ends. There are twelve pairs of papillæ, five preanal and seven postanal. The first two preanal pairs are slender and stalked alongside the sucker. The next are large blunt-headed processes placed laterally and a short distance in front of the anus. Between this pair and the last preanal pair is a large subventral sessile pair. The last preanal pair are pedunculate and the largest of the series. The first three postanal pairs lie close together immediately behind the anus, and include a large subventral sessile pair. The others are more lateral and digitiform, the anterior pair being small and short, the posterior pair much larger. The next pair are large and stalked, whilst the last three postanal pairs form a group at the base of the spike—two lateral and bulbous, with the other intermediate, subventral, and circular in ontline.

In the female the tail is long and straight, tapering gradually to a fine point. The vulva is situated about the middle of the body. The uterus bifurcates a short distance from the vulva. Cuticular papilliform projections, varying in size, number, and position, are present close to the vulva, usually posteriorly, but at times anterior to it. They may be the result of the application of the male sucker. The eggs are oval, with a clear space (8 μ) between the yolk and the shell.

Numerous species of the *Heterakis* from birds have been described. These are summarized by Cram (1927). A comparison between those with equal spicules and the present species shows that the length of the spicules is significant. The diameter of the preanal sucker, the number and distribution of the papillæ, the ratios of the tail and the œsophagus to the total length, and the size of the eggs, apart from other differences revealed by comparative measurements, are distinguishing features sufficient to establish this new species.

The work was carried out at Birkbeck College, University of London, and my thanks are due to Dr. H. A. Baylis for the opportunity of examining the material. The type-specimens are in the British Museum (Natural History).

REFERENCE.

CRAM, E. B. (1927.) "Bird Parasites of the Nematode Suborders Strongylata, Ascaridata, and Spirurata." Bull. 140 U.S. Nat. Museum.

Fig. 7.

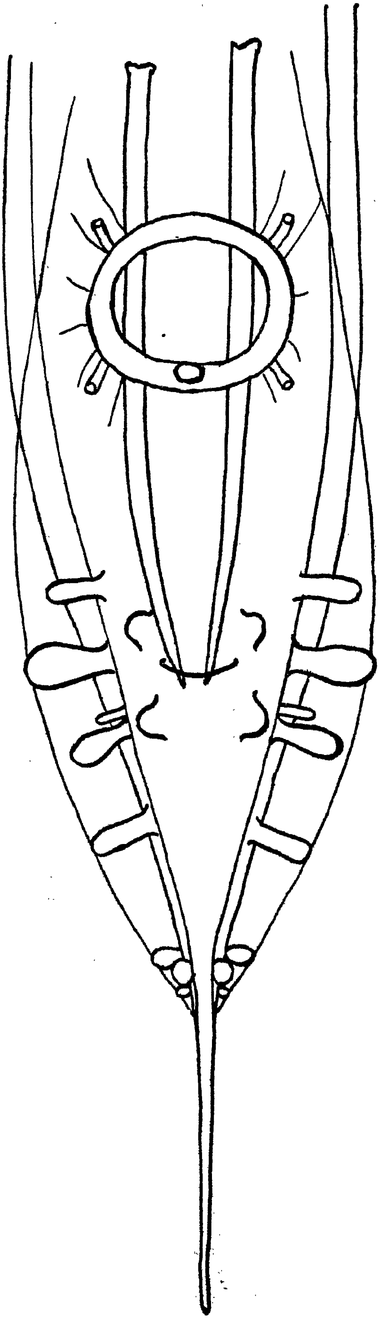
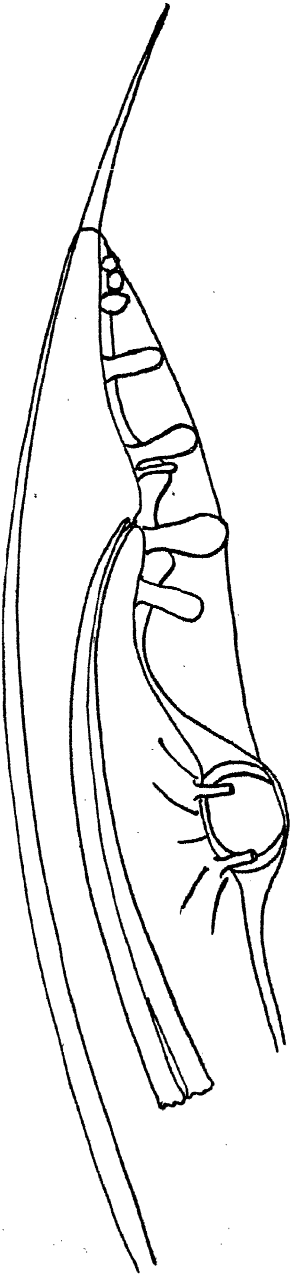


Fig.



EXPLANATION OF FIGS. 7 & 8.

Heterakis altaica, sp. n.

Fig. 7.—Male tail, ventral view.
Fig. 8.—Ditto, lateral view.

Table of Measurements of Subulura tetraogalli, *sp. n.*

	♀.	♀.	♂.
	mm.	mm.	mm.
Length	17·16	14·22	8·73
Width	·41	·39	·35
Width of head-region	·083	·062	·075
Dimensions of buccal cavity	·046 × ·0375	·046 × ·0333	·0375 × ·029
Length of œsophagus (including bulb)	1·37	1·12	1·015
Width of œsophagus (anterior end)	·05	·062	·062
Width of œsophagus (minimum)	·042	·046	·044
Width of œsophagus (maximum)	·108	·137	·116
Dimensions of bulb	·29 × ·129	·25 × ·158	·212 × ·15
Length of tail	1·08	1·04	·24 (spike = ·06)
Spicules, length	..	..	1·13
" width	..	..	·02
Gubernaculum, length	..	..	·187
" width at anterior end	..	..	·13
Gubernaculum, depth at anterior end	..	..	·04
Length of sucker	..	..	·208
Width of sucker	..	..	·04
Distance of posterior edge of sucker from anus	..	..	·353
Width of alæ	·054	·054	·048
Distance of vulva from anterior end	7·06	5·59	..
Dimensions of eggs	62 μ × 50 μ	70 μ × 54 μ	..
Length of œsophagus / Total length	1/12·5	1/12·68	1/8·6
Length of tail / Total length	1/15·9	1/13·7	1/36·4
Vulva from anterior end / Total length	1/2·43	1/2·53	..
Nerve-ring from anterior end	·06 ?	·06 ?	·08 ?
Excretory pore from anterior end	·104 ?	·104 ?	·104 ?

Table of Measurements of Heterakis altaica, *sp. n.*

	♂. mm.	♀. mm.
Length	13	16·5
Width, anterior end	·12	·12
„ maximum	·53	·62
„ sucker	·48	..
„ anus	·29	·24
Excretory pore from anterior end	·13 ?	·13 ?
Nerve-ring from anterior end	1·16 ?	1·15 ?
Dimensions of lips	·059 × ·038	·062 × ·041
Length of œsophagus (total)	1·55	1·6
„ „ anterior portion (pharynx)	·112	·117
Length of bulb	·38	·41
Width of œsophagus (anterior end)	·06	·067
„ „ posterior portion (middle)	·094	·112
Width of bulb	·284	·312
Distance of vulva from anterior end	..	8·6
Dimensions of eggs	..	75 μ × 54 μ
Length of tail (total)	·72	1·63
„ „ (spike)	·355	
Sucker, diameter	·27	
„ length	·23	
„ depth	·17	
Distance from sucker to anus	·29	
Spicules, length	·73	
„ width (maximum)	·038	
$\frac{\text{Length of œsophagus}}{\text{Total length}}$	1/8·4	1/10
$\frac{\text{Length of tail}}{\text{Total length}}$	1/16	1/10
$\frac{\text{Vulva from anterior end}}{\text{Total length}}$	..	1/1·9

LIII.—*Two rare Stomatopods of the Genus* Lysiosquilla, *Dana.* By ISABELLA GORDON, D.Sc., Ph.D.

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A SMALL collection of Stomatopoda from Natal, north of Durban, contains two specimens of considerable interest, in that each belongs to a species hitherto known only from the type-specimen. Species of the genus *Lysiosquilla* "seem to live in deep burrows which they leave only on rare occasions, and to this fact may be attributed the scarcity of specimens in collections and the large number of forms which are known

Fig. 1.

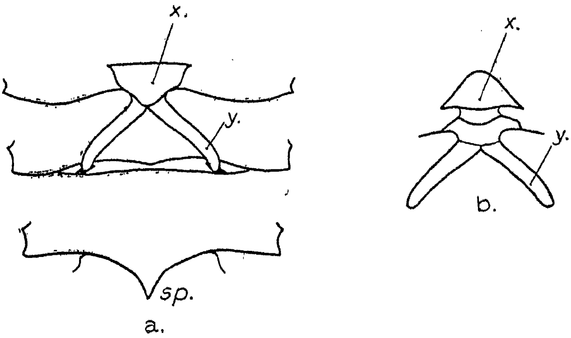
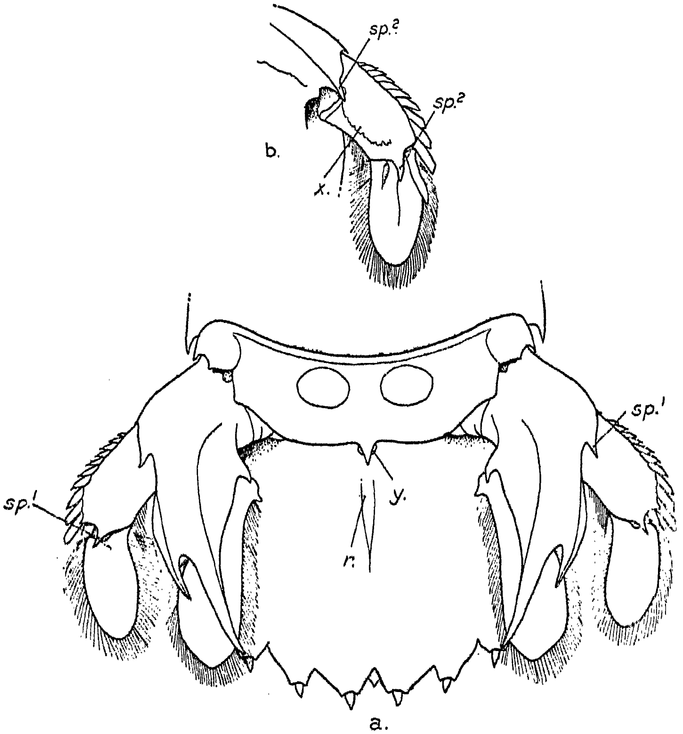


Fig. 2.



Lysiosquilla crassispinosa, Fukuda.

Fig. 1.—a, part of thoracic sternum; b, female genital opening with flap turned forward. × 2.

Fig. 2.—a, telson and uropods, ventral aspect; b, exopodite of right uropod, dorsal aspect. Nat. size.

only from single individuals" (Kemp, 1913, p. 7). The rediscovery of the following two species is therefore deemed of sufficient importance to be placed on record.

Lysiosquilla insignis, Kemp.

1911. Kemp, Rec. Ind. Mus. vi. p. 94.
1913. Kemp, Mem. Ind. Mus. iv. no. 1, pp. 126–128, pl. ix. figs. 99–102.

A male specimen, measuring 52 mm. in length, agrees in all details with Kemp's careful description of the type-specimen—also a male.

The type-specimen was found off N. Andaman Island.

Lysiosquilla crassispinosa, Fukuda.

1910. Fukuda, Annot. Zool. Japon. vii. pt. 3, pp. 146–149, pl. iv. figs. 4, 4 *a*.
1913. Kemp, Mem. Ind. Mus. iv. no. 1, p. 117.

A female specimen measuring 20 cm. in length undoubtedly belongs to *L. crassispinosa*; the type-specimen, also a female, was taken in the Sagami Sea, Japan. The astonishing distance separating the places at which the two specimens were found may be bridged by future discoveries of the species, but a statement of its distribution, based on the known material, would be premature.

Eleven spines on the dactylus of each raptorial limb, a pair of movable spines on the manus near the groove for the terminal dactylar spine, followed by one jointed spine, then another movable spine, and, after a considerable interval, nine or ten jointed spines.

Fig. 1 **a** represents part of the thoracic sternum; on the anterior lip of the female genital opening is a conspicuous triangular flap (*x.*, fig. 1 **a** & **b**), from the posterior lip two long movable horns project obliquely outward and backward (*y.*, fig. 1). There is a prominent ventrally directed spine on the last thoracic segment (*sp.*, fig. 1).

A ventral (*sp.*^{1}) and a dorsal (*sp.*^{2}) spine at the posterior extremity of the basal uropod segment and of the proximal segment of the exopodite (fig. 2 **a** & **b**). On the dorsal surface of the latter segment a prominent ridge with irregularly serrate margin (*x.*, fig. 2 **b**). The anus far forward on the telson under the acute spine on the posterior border of the preceding segment (*y.*, fig. 2 **a**). A short distance behind the anus a prominent ridge (*r.*, fig. 2 **a**).

For a fuller description, the reader is referred to Fukuda's paper.

Locality. Off Natal, north of Durban, 150 fath.

LIV.—*A remarkable new Genus of Coccinellid Coleoptera.*

By Gilbert J. Arrow.

The insect here described was discovered in a nest of the stingless bee (*Melipona alinderi*), inhabiting British East Africa, by the late S. Alinder, and submitted to me by Dr. George Salt. Three specimens are known. The type is in the British Museum collection.

The degree of specialization is so great that it is not possible to say to what known genera there is nearest relationship, but, making due allowance for this specialization, I think it will not be disputed that the genus can be referred to the family Coccinellidæ. The shape of the femora and tibiæ, the lobed three-jointed tarsi, the very short antennæ with four-jointed club, the formation and interlocking of the pro- and mesosternum clearly indicate this relationship, and even the remarkable concealment of the head is in a less degree found in certain genera of Coccinellidæ (*Cranophorus, Oryssomus*, etc.). The entire suppression of the eyes has, however, reduced the head to extremely small proportions and rendered possible its complete retraction within the prothorax, so that, even when examined from beneath, only the tips of the antennæ and palpi are visible. The lower face of the pronotum forming the roof of the cavity contains three depressions, of which the middle one lodges the head and the two lateral ones the antennæ. The terminal clubs of these, although small, are large relatively to the reduced size of the organs. The legs, with narrow tibiæ capable of being withdrawn completely behind the broad femora, are not peculiar, nor are the broad epipleuræ of the elytra, containing well-defined hollows into which the legs, when folded, fit. In conjunction with the retractile head, the effect of these arrangements is that the outer margins of the thorax and elytra form a continuous oval rim, which, when pressed against the ground, encloses the whole body like the shell of a limpet. A series of other remarkable adaptations seem designed to give the insect the utmost rigidity when in this position. The prosternum is produced into a very sharp point which fits into a socket in the mesosternum. This in a rather less perfected degree is found in many Coccinellidæ, but, in addition, our insect possesses accessory interlocking devices. On each side of the mesosternal cavity which receives the prosternal process is a rounded lobe which overlaps the bases of the fore legs. Beneath the hind margin of the pronotum on each side is a strong backwardly-directed tooth, with a deep recess on its inner side and another cavity longer and less deeply situated on the outer side. The tooth fits into a corresponding pit formed between the shoulder of the elytra and the mesonotum, and upon the latter are two projections which similarly fit into the cavities on each side of the tooth, the inner one apparently formed by the episternum and the outer by the epimeron. The mesosternum also is produced sharply outwards on each side to give support to the middle femur, while the metasternum at the sides forms a projecting ledge behind which the hind femur is lodged.

The most surprising feature in the whole anatomy is the complete fusion of the metasternum with the base of the abdomen. The last four segments of the latter are freely movable, but between these and the hind legs is a basal part longer than the four free segments together and continuous with the metasternum, the line of junction between the very widely separated legs being completely obliterated. There is a large oval depression occupying the middle of the metasternum and extending well into the abdomen, but its hind margin is indefinite, and it is impossible to determine the respective shares of thorax and abdomen in its composition. It is probable that two abdominal sternites contribute to this great undivided plate, for, although a fifth free segment can be distinguished, it is only slightly extruded, and the large one which precedes it appears to correspond to the usual sixth (terminal) sternite.

It is necessary to form for this curious insect a new genus, for which I propose the name

CLEIDOSTETHUS, gen. nov.

Corpus late ovatum, depressum, haud alatum. Pronotum fere semicirculare, antice haud emarginatum, capitem obtegens. Scutellum nullum. Elytra consolidati. Caput minutum, retractile, absque oculis. Antennæ brevissimæ, 8-articulatæ, clava compacta, 4-articulata. Pedes omnes late separati. Femora lati, tibias obtegentia. Tibiæ angustæ, bisinuatæ. Tarsi 3-articulati, lobati, angusti. Prosternum antice capitem obtegens, postice acute productum. Mesosternum latum, antice cavatum, utrinque acute producto. Metasternum cum abdomine consolidatum. Abdominis pars basalis longa, immobilis, pars postica brevis, 4-articulata, libera.

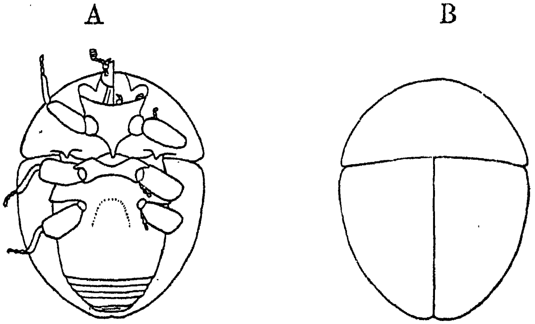
Cleidostethus meliponæ, sp. n.

Totus ferrugineus, tibiis, tarsis, antennisque pallide flavis, corpore supra setis minutissimis, pallidis, haud dense vestito: late ovalis, corpore supra leviter convexo, minute et crebre granuloso-rugoso, corpore subtus sat fortiter asperato-punctato, nitido, vix setoso, prothoracis et elytrorum lateribus subtus latissimis et lævissimis. Long. 1·75 mm.; lat. 1·25 mm.

Hab. Kenya: in nido *Meliponæ alinderi*.

Type in Brit. Mus.

In the accompanying figure of the lower surface of the insect the right half of the head is represented in its retracted position and the left half as unnaturally drawn out, in order to show its form. The legs also are folded on the right side of the figure and extended on the left. The drawings have been made for me by Dr. Salt.



Cleidostethus meliponæ, gen. et sp. n.
A, ventral surface; B, dorsal surface.

LV.—*Descriptions of new, and some Notes on old, Species of* Coccidæ. By F. Laing, M.A., B.Sc., British Museum (Nat. Hist.).

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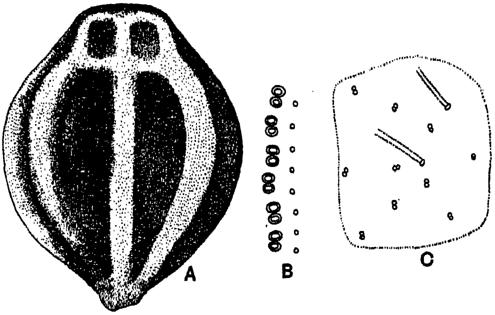
The following descriptions of, and notes on, Coccidæ represent part of the results of the examination of the large amount of material from various sources which has recently passed through my hands. My thanks are due to the individual collectors mentioned in the descriptions, but I am more especially indebted to Dr. G. A. K. Marshall, the Director of the Imperial Bureau of Entomology, through whom most of the material has been sent, and to the Government Entomologists of the various Colonies who have been indefatigable in collecting specimens of this economically important and most interesting family of insects.

Asterolecanium hancocki, sp. n. (Fig. 1.)

Test of adult female with a pale grey to sandy-coloured waxy covering, the surface underneath dark brown, low convex, broadly oval, produced behind into a short blunt point; dorsum conspicuously tricarinated, a straight median longitudinal ridge and a curved sublateral carina on either side meeting the median at the same point in front and more or less merging in it behind, waxy covering forming transverse thickenings at intervals; a deep depression between these ridges; a transverse ridge in front divides off from these depressions two subcircular foveæ; whole surface slightly granular. Fringe too broken in all the specimens for accurate description, but apparently continuous around the margin, composed of a close single layer of very short, glassy, faintly pink, curled fibres. Width varying to a considerable extent, sometimes as great as four-fifths the length.

Fig. 1.



Asterolecanium hancocki, Laing, sp. n.

A, dorsal aspect of test of ♀; B, marginal gland series; C, part of dorsum showing glands and spinnerets.

Length 1·5 mm.; breadth from 1 to 1·5 mm.

Adult female subcircular, shortly conical behind. Antennal tubercles with several setæ. Anterior stigmata with a few small circular pores near the mouth and an irregular scattered series extending to margin; posterior pair with a similar series, but less numerous and more irregular. A single marginal series of 8-shaped pores, closely set, the interval between each about equal to length of one pore; an inner, single, regular row of small circular pores. Scattered fairly thickly throughout ventral surface are small 8-shaped pores about half the size of marginal series, while on dorsal surface are numerous circular pores slightly larger than those of marginal series, indefinitely arranged immediately in front of anal setæ, but on each of the preceding five segments there is a single transverse discontinuous series. Tubular pores numerous throughout whole surface.

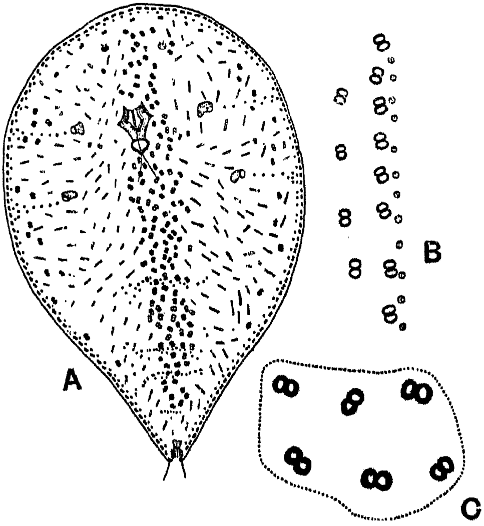
Length 0·92 mm.

UGANDA: Kuvezeke, on bark of coffee (*G. L. R. Hancock*).

Asterolecanium coffeæ, Newst. (Fig. 2.)

Professor Newstead's description of *A. coffeæ* is sufficiently detailed not to require any elaboration; the fact that he had for examination spirit-material only probably accounts for his having described the filaments of the puparium as golden yellow, whereas in dry material I have examined from various localities throughout E. Africa they appear to me to have a very distinct pink colour. I add a figure of the adult female which may serve to make the identification of the species easier, as well as serve for comparison with that of *A. hancocki*.

Fig. 2.



Asterolecanium coffeæ, Newst.

A, adult ♀; B, marginal series of pores; C, 8-shaped pores of median series (B and C of the same magnification).

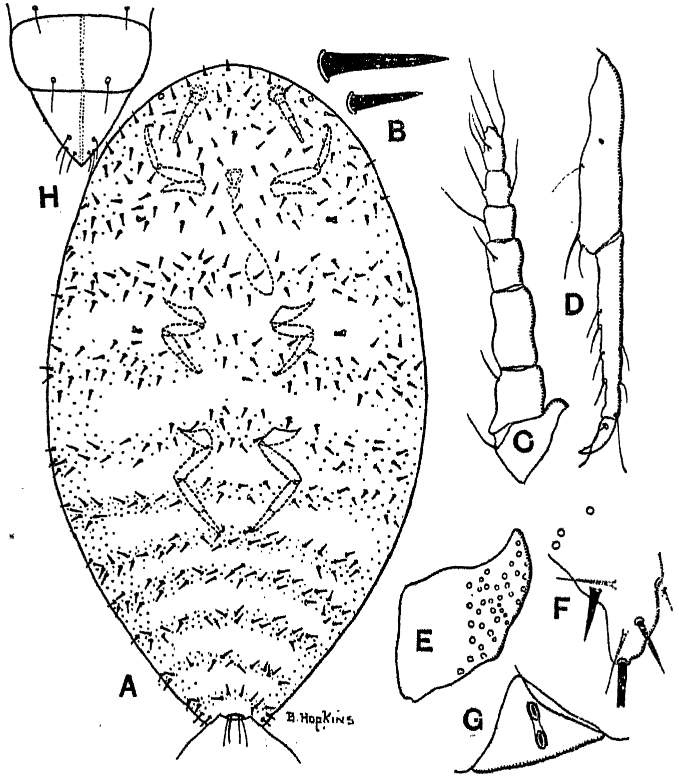
Eriococcus tucurincæ, sp. n. (Fig. 3.)

Material preserved in alcohol; test apparently whitish, closely felted, homogeneous, ovate, completely enclosing ♀ except for the small oval caudal opening.

Length 3 mm.; breadth not quite 2 mm.

Adult ♀ very dark brown to chocolate (when preserved in spirit), the antennæ and legs pale yellowish or stramineous, rather turgid, segments distinct, the dorsal spines outstanding. Clearing completely in potash; under pressure, breadth about five-eighths length, ovate in shape. Antennæ of seven segments, the proportion of each as follows: (1) 15, (2) 20, (3) 25, (4) 25, (5) 10, (6) 10, (7) 15; two setæ on segments i. and ii., none on iii., two subapical on iv., one short spinose seta on v., four on vi., and about six on vii.; width of basal segment twice length. Eyes distinct. Rostrum short, broad, robust, the length not so great as breadth, of two segments, both subequal in length, the basal approximately half the breadth. Spiracles small, the posterior pair with a few small

Fig. 3.



Eriococcus tucurincæ, Laing, sp. n.

A, adult ♀; B, dorsal spines; C, antenna; D, hind tibia and tarsus; E, hind coxa; F, anal tubercle; G, trochanter; H, rostrum.

circular disc-pores near but not immediately adjoining it. Legs normal, the tibia and tarsus subequal in length, and the two together somewhat longer than the corresponding femur and trochanter; claw with a small subapical denticle; both pairs of digitules long, filiform, and knobbed apically, the tarsal pair the more robust; hind pair of coxæ with pores on external half, the pores large, isolated and distinct, not grouped; the hind femora with a few pores on external side towards apex; each trochanter with a pair of oval median pores. Body-spines numerous, evenly, but irregularly, distributed over the whole body, slightly more numerous perhaps on cephalic area, of two or perhaps three sizes, the smallest about half size of largest, latter stout, sharp-pointed, smaller of same shape; circular disc-pores fairly numerous posteriorly and around anal ring; large circular glands scattered throughout dorsum; paranal lobes well developed, completely chitinised, the long apical seta about twice length of an anal-ring one, two large and one smaller spine on dorsum, and two slender setæ on inner margin.

Length 2·7 mm.; breadth 1·8 mm.

COLOMBIA: Tucurinca, on an undetermined species of plant (*C. C. Gowdey*).

In itself the presence of paired glands on the trochanter is not a specific character, for other species have it, nor is it confined to that section of the genus which possesses a toothed claw. The species appears to be rather closely related to *E. bahiæ*, Ehrh., but the more numerous and the disposition of the body-spines, the character of the paranal lobes, slight differences in the relative lengths of the antennal segments, and a few other minute characters appear to be distinctive. From *E. perplexus*, Hemp., it may be distinguished very readily by the grouped pores on the hind coxæ of the latter species.

Rhizœcus poltavæ, sp. n. (Fig. 4.)

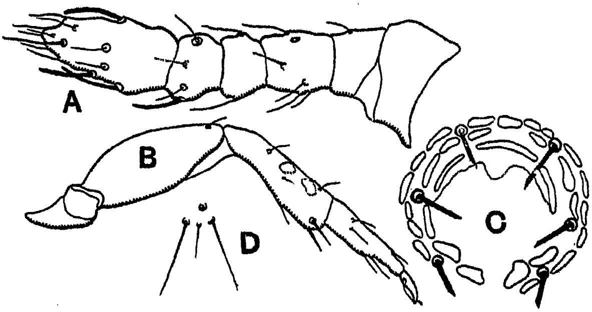
Adult ♀ preserved in alcohol and external characters unknown; broadly oval, tapering slightly posteriorly, subglabrous. Antennæ very short, comparatively broad, 6-segmented, segments in following proportions: (1) 15, (2) 11, (3) 19, (4) 11, (5) 14, (6) 36; each segment with several slender setæ, a blunt falciform apical spine on the fifth, and on the sixth are, submedianly, two similar spines on one side and one on the other, together with a stoutish sharp-pointed subapical spine. Rostrum dimerous, both segments subequal, terminal with numerous fine setæ apically. Legs small, the length of trochanter and femur together subequal to that of tibia and tarsus, the length of tarsus and claw about equal to tibia; each tibia with a pair of rather strong apical spines; ungual digitules present, very slender, faintly knobbed; hind tibiæ with two large subcircular vacuolæ on outer margin. Cerarii non-existent, the position of anal pair marked by two, perhaps three, longish setæ and a few much shorter ones; the preceding two or three segments with a few short, slender, scattered setæ on the margin. Pores of anal ring narrow, elongate, few in number.

Length 2·13 mm.; breadth 1·26 mm.

CRIMEA: Poltava, on an unspecified plant (*A. N. Kiritchenko*).

Green has recently (Ent. Mon. Mag., July 1926, p. 174) redefined the genus *Rhizœcus*, laying particular stress on the large irregular cells present in the anal ring, in contradistinction to the beaded type found in *Ripersia*. The species here described obviously belongs to *Rhizœcus* as thus defined, and the presence of the vacuolæ, faint but distinct, on the hind tibiæ should render it easy of recognition.

Fig. 4.



Rhizœcus poltavæ, Laing, sp. n.

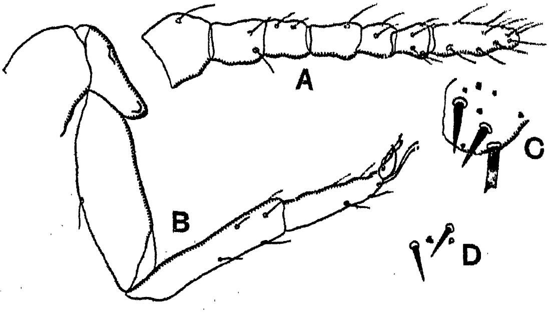
A, antenna; B, hind leg; C, anal ring; D, marginal setæ on last abdominal segment.

Trionymus natalensis (Brain). (Fig. 5.)

UGANDA: Kampala, on grass (*H. Hargreaves*).

The pronounced apical projection on each trochanter renders

Fig. 5.



Trionymus natalensis, Brain.

A, antenna; B, hind leg; C, last cerarius; D, penultimate cerarius.

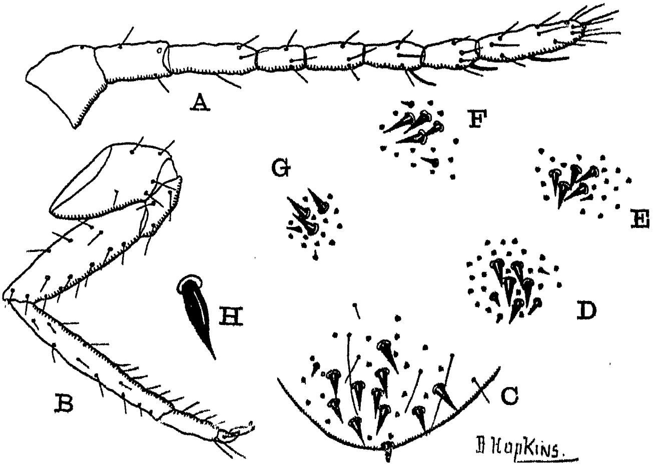
this species easy to determine. Though Brain treats it as a *Pseudococcus* it should rest, I think, in *Trionymus* as this genus is now understood, for only the last two pairs of cerarii are present with certainty, though in one or two specimens a third can be distinguished, but it is inconspicuous on account of the remoteness of the two spines.

Pseudococcus bukobensis, sp. n. (Fig. 6.)

Specimens preserved in spirit and nature of secretion unknown, but from the colour of the alcohol there is probably a considerable amount of sulphur-yellow powder.

Adult ♀, when prepared, elliptical, the length being about one and a half times the width. Antennæ 8-segmented, the proportions of the segments being: (1) 30, (2) 35, (3) 40, (4) 23, (5) 30, (6) 27, (7) 26, (8) 52; two or three slender subapical setæ on each segment, numerous on terminal, one strong blunt subapical marginal seta on vi. and vii., and one lateral median and two apical on viii. Mouth-cone stout; anterior pair of spiracles distinctly smaller than posterior. Cerarii consisting of eighteen pairs, composed of spines differing in size; anal with ten to eleven strong spines and a few slender setæ, the remaining cerarii with the following number of spines: (17) 6, (16) 6, (15) 5, (14) 6, (13) 4, (12) 4, (11) 3, (10) 2, (9) 4, (8) 4, (7) 5, (6) 3, (5) 4, (4) 4, (3) 5, (2) 3, (1) 4; the spines in each cerarius varying somewhat in size; area surrounding last three pairs of cerarii only slightly chitinized, the

Fig. 6.



Pseudococcus bukobensis, Laing, sp. n.

A, antenna; B, hind leg; C–G, cerarii of eighteenth–fourteenth segments; H, type of dorsal spine.

trilocular pores not crowded. Dorsum with numerous trilocular pores and short lanceolate spines; under surface with transverse series of large circular pores on the posterior four or five segments, and with long slender setæ, specially numerous on cephalic area. Legs normal, well developed, tarsus a little more than one-third length of tibia, the latter distinctly longer than femur; hind coxa with a very few minute pores; claw without a denticle; tarsal digitules slender, minutely knobbed, ungual extending beyond tip of claw.

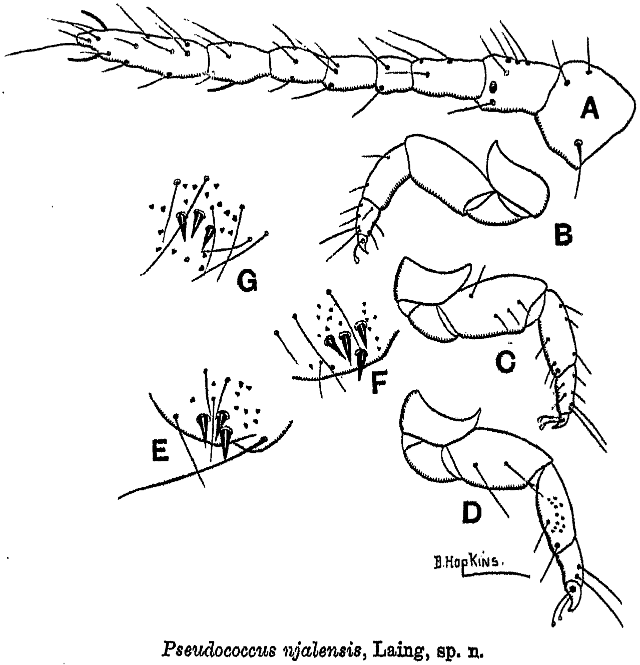
Length 3 mm.; breadth 1·5 mm.

TANGANYIKA TERRITORY: Bukoba, on coffee (*A. H. Ritchie*).

Pseudococcus njalensis, sp. n. (Fig. 7.)

Specimens preserved in alcohol and external characters not observed.

Fig. 7.



Pseudococcus njalensis, Laing, sp. n.

A, antenna; B, C, D, front, median, and hind leg; E, F, G, last, antepenultimate, and penultimate cerarii.

Adult ♀ broadly oval. Antennæ 8-segmented, segments in the following proportions: (1) 20, (2) 23, (3) 22, (4) 13, (5) 16, (6) 18, (7) 20, (8) 37; numerous hair-like setæ on each segment, a rather stouter subapical seta on the seventh, and a single median and a subapical on either side of the terminal. Posterior stigmata distinctly larger than anterior. Cerarii consisting of eighteen pairs, anal pair protruding, the posterior pairs faintly chitinized, the spines on each varying from two to six, usually two stout spines of each equal in size, the others being either considerably shorter or else more slender, the following the average number of spines per cerarius: (18) 3, (17) 3, (16) 4, (15) 4, (14) 6, (13) 5, (12) 4, (11) 3, (10) 3, (9) 3, (8) 4, (7) 3, (6) 2, (5) 2, (4) 4, (3) 4, (2) 2, (1) 2; a few auxiliary setæ present on the more posterior; cerarian trilocular pores not crowded. Legs robust, stout, broad, and short, the combined length of the claw, tarsus, and tibia, if anything, slightly shorter than that of the femur and trochanter; tarsus about two-thirds length of tibia; claw without a denticle; both pairs of digitules knobbed, tarsal filiform, ungual stouter and extending beyond tip of claw; femur broad in proportion, breadth approximately half the length; hind tibiæ with sensoria along their outer margin. Dorsum with trilocular pores only and numerous slender hair-like setæ, more abundant on cephalic region; ventral disc-pores few, confined mainly to the hind margins of the last three segments; ventral setæ slender, numerous. Both pairs of dorsal ostioles rather wide with thick lips; median ventral cicatrice irregularly circular.

Length 1·85 mm.; breadth 1·4 mm.

SIERRA LEONE: Njala, on the berries of coffee (*E. Hargreaves*).

The remarkably short, stout, broad legs, allied with the numerous spines of dissimilar size on most of the cerarii should render this species easy of recognition.

PARAPUTO, gen. nov.

Belonging to the Pseudococcine series. Adult ♀ with six segments to the antennæ; rostrum dimerous; legs perfect, but reduced in size, robust; claw without a denticle; cerarii not present on all the segments, but there are two between the antennæ and a pair on each of the last eight abdominal segments; spines on abdominal cerarii numerous; lateral groups of short tubular ducts on posterior abdominal segments; anal ring with six setæ; dorsal surface with bluntly pointed spines.

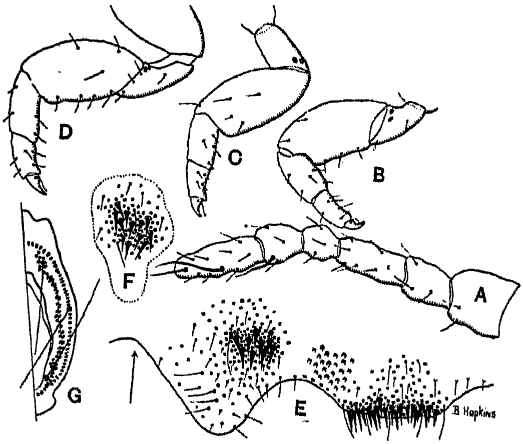
Genotype, *Paraputo ritchiei*, sp. n.

Paraputo ritchiei, sp. n. (Fig. 8.)

Specimens, preserved in alcohol, about as broad as long, rather narrow in front, widest across posterior segments, rather highly convex, yellowish brown, with a certain amount of white waxy matter still adhering to the segments.

Length, subequal to breadth, 3 mm.

Adult ♀, when mounted, somewhat longer than broad. Antennæ of six segments in the proportions of: (1) 15, (2) 20, (3) 25, (4) 13, (5) 15, (6) 30, segments 3 and 6 rarely subequal; one rather long, robust, blunt subapical spine on 5, and 6 has, in addition to a few slender apical setæ, two robust ones and a lateral submedian long one. Rostrum dimerous, apical segment rather long. Both pairs of spiracles rather large. Cerarii markedly dissimilar, the posterior seven of the type found in the genus *Puto*, that is, composed of a bunch of spines intermixed with a number of slender setæ, the last cerarius with seven such spines, the preceding three with 15 to 17, the three in front of that with 11 to 13, another cerarius on the preceding segment with four, and the remaining segments either without cerarii or else so faintly developed that they merge with the general body-spines, except for two interantennal ones composed of three or four rather long, sharp-pointed spines; between the last three cerarii, on the intersegmental area, are two well-marked groups of short spinnerets.



Paraputo ritchiei, Laing, sp. n.

A, antenna; B, C, D, first, second, and third leg; E, last and penultimate cerarii; F, seventh cerarius from the end; G, anal ring.

General surface of body rather closely set with small circular pores and with, especially on cephalic area, numerous robust, often curved, blunt setæ. Dorsal ostioles conspicuous; median ventral ostiole broad transversely. All three pairs of legs short, robust, of the type found in *Pseudococcus filamentosus* (Ckll.), the tibia, tarsus, and claw together less than the length of femur, the claw a little more than half tarsus, the latter two-thirds tibia; the hind coxæ basally studded with minute sensoria; both pairs of digitules present, small, inconspicuous, tarsal pair thread-like; ungual pair knobbed and extending a little beyond claw; claw without a denticle.

TANGANYIKA TERRITORY: Bukoba, on a tree-trunk (*A. H. Ritchie*).

Puto barberi (Ckll.).

I am favoured by Dr. A. H. Morrison, of the U.S. Bureau of Entomology, with specimens of *Puto barberi* (Ckll.), and I find on comparing them with my *Phenacoccus trinidadensis* (Bull. Ent. Res. xvi. p. 52, 1925) that the latter falls as a synonym. An examination of a fairly extensive series shows that the ventral cicatrice is not always present.

Phenacoccus latipes, Green, var. *slavonicus*, nov.

This new variety is distinguished by its more slender legs and 8-segmented antennæ. The claw has a denticle as in the typical species, and the dermal pores, cerarial setæ, and other characters are as in *P. latipes*.

ODESSA: on *Hordeum distychum* (*Alexis Kiritchenko*).

Phenacoccus phaseoli, sp. n. (Fig. 9.)

External appearance not noted; specimens preserved in alcohol.

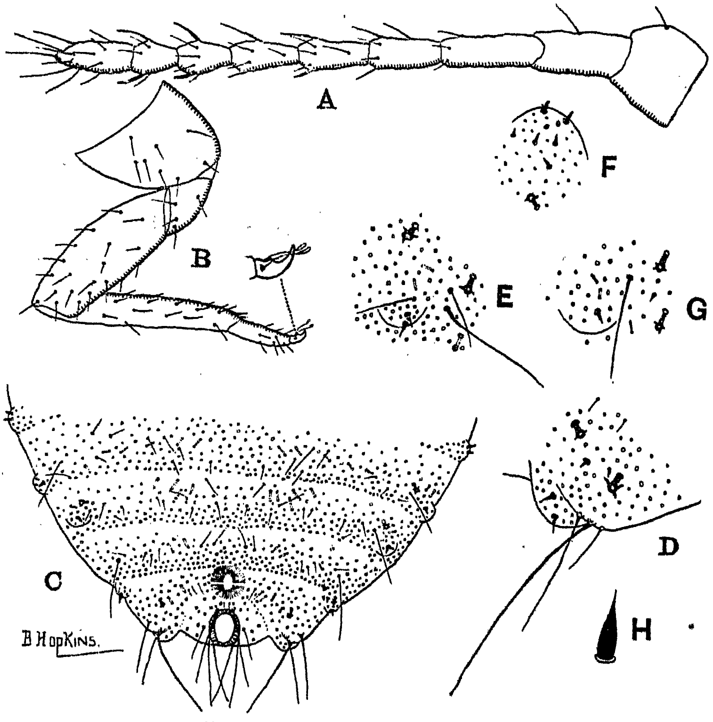
Antennæ 9-segmented, the segments in the following proportions: (1) 30, (2) 40, (3) 40, (4) 26, (5) 30, (6) 25, (7) 23, (8) 20, (9) 35; terminal segment rather pointed; hairs on all segments slender. Rostrum dimerous, distal segment considerably the longer. Both pairs of spiracles strongly developed. Legs normal, tibia of each pair from two and a half to three times length of tarsus; tibiæ with two stout spines at apex; hind tibia slightly dilated; claw with denticle; ungual digitules slender, dilated apically, tarsal digitules either absent or indistinguishable from ordinary tarsal hairs. Cerarii consisting of thirteen pairs, on prominent tubercles, the most anterior being between the eye and the base of the antenna, no interantennal cerarii; anal pair of cerarii prominent; two spines to each cerarius, except the ocular, which has four, spines on the last well developed, but they gradually decrease in size and become more remote from each other from behind forwards; spines lanceolate in form; cerarian pores of the usual triangular shape, not crowded; a few small lanceolate spines distributed throughout dorsum; large conspicuous dorsal pores, with thick chitinous rims bearing usually three small spines, leading to thick-walled tubular ducts, these pores confined, mainly in pairs, to the margin and the median area of each segment and to the cephalic region; large, round, ventral disc-pores very numerous, in crowded transverse series posteriorly, and extending forward in reduced numbers to in front of rostrum; ventrally, also, are numerous setæ of various sizes, most abundant on anterior region; ventral cicatrice transversely oval.

Length up to 4 mm.; breadth varying correspondingly up to 2·5 mm.

SIERRA LEONE: Hill Station, on dwarf beans (*E. Hargreaves*).

This species can be readily separated from *P. stachyos*, Ehrh., by the absence of cerarii from the interantennal region, the larger and more prominent cerarii, the more numerous cerarian disc and tubular pores, and the larger and stouter limbs. I have been unable to obtain authentic material of *Heliococcus bohemicus*, Sulc (*Phenacoccus hystrix*, Ldgr.), for examination and comparison; from Sulc's description the number of cerarii would appear to be eighteen pairs. If his figures can be relied upon, one conspicuous difference between *H. bohemicus* and *P. phaseoli* lies in the number of spines on the hind tibiæ, the former having numerous distal spines, while the latter has but two apical ones. A good case could be made out for the retention of the genus *Heliococcus*.

Fig. 9.



Phenacoccus phaseoli, Laing, sp. n.

A, antenna; B, hind leg; C, posterior segments of abdomen; D–F, thirteenth to eleventh cerarii; G, ocular cerarius; H, body-spine.

Lœmica, gen. nov.

Belonging to the Coccinæ. Adult female secreting a short, horny, triangular (when viewed sideways) ovisac; antennæ

6-segmented, short, broad; dorsum with a marginal belt of small circular pores leading to tubular ducts; stigmatic spines two, remote from each other; legs with tibio-tarsal articulation obsolete or subobsolete.

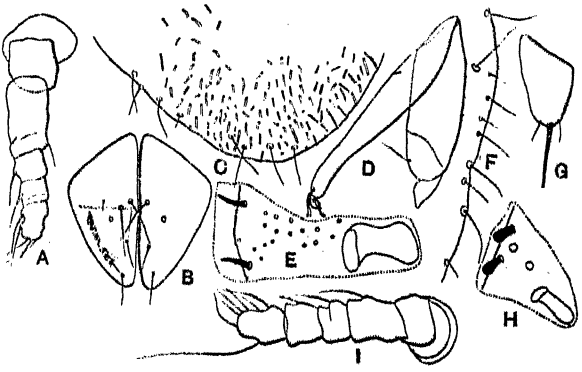
Genotype: *Lœmica ghesquierei*, sp. n.

This genus is probably most closely related to that part of *Lecanopsis* which contains such a species as *L. ceylonica*, Green. The female of the latter is partially surrounded and covered by a white felted test quite distinct from the horny ovisac secreted by *Lœmica*; microscopically, however, *Lecanopsis ceylonica*, Green, and *Lœmica ghesquierei*, sp. n., agree in many characters, including the absence of the tibio-tarsal articulation.

Lœmica ghesquierei, sp. n. (Fig. 10.)

Adult ♀ pale yellowish brown, transversely wrinkled, broadly oval, and with a distinct longitudinal keel. Ovisac very pale yellowish brown, very finely striated longitudinally, horny in texture, high, shortly triangular, or slipper-shaped, the female closing the end of the triangle and almost perpendicular to the twig, and with a very distinct sharp median carina which has a white secretion along its whole length. Length of ovisac 2·5 mm.; height 2 mm.; breadth 2 mm.

Fig. 10.



Lœmica ghesquierei, Laing, sp. n.

A, antenna; B, anal lobes; C, part of dorsal marginal area; D, mid-leg; E, anterior spiracle and stigmatic spines; F, margin of adult ♀; G, anal lobe; H, spiracle and stigmatic spines; I, antenna of larva.

Adult ♀ broadly oval; antennæ with six segments, but by subdivision of the third the number may be increased to seven, whole antenna short and broad, segment iii. as long as the three terminal segments together, each of whose length is subequal to its breadth; where the antenna is 7-segmented the basal four are subequal.

Dorsum rather densely chitinized, with a broad marginal area thickly set with small circular openings leading to short tubular ducts; margin with long spinose setæ separated by intervals about equal to length of a single seta; another shorter series slightly more internal, more widely separated; stigmatic spines two, of equal length, stout, rounded apically and wide apart, the distance at least equal to thrice the length of a spine. Legs well developed, the tibio-tarsal articulation obsolete in the second and third pairs, but its position in the front pair is apparently indicated by a slight notching or infolding at the margin; tibio-tarsus considerably longer than the combined length of femur and trochanter; ungual digitules expanded, broad, tarsal ones knobbed, both pairs extending well beyond claw. Anal lobes surrounded by a narrow, densely chitinized area, the base about equal to outer margin, outer angle rounded, three dorsal and one subapical spines; two fringe-setæ and probably other two smaller ones submarginally.

Length 2·2 mm.; breadth 1·3 mm.

The larva has also a 6-segmented antenna with a very long seta springing from the middle of the terminal joint, while the two stigmatic spines are somewhat closer together than in the adult, and are broad, flat, and rounded apically.

BELGIAN CONGO: Kasai, subterranean on the roots of grass (*J. Ghesquière*).

Ctenochiton arborescens, sp. n. (Fig. 11.)

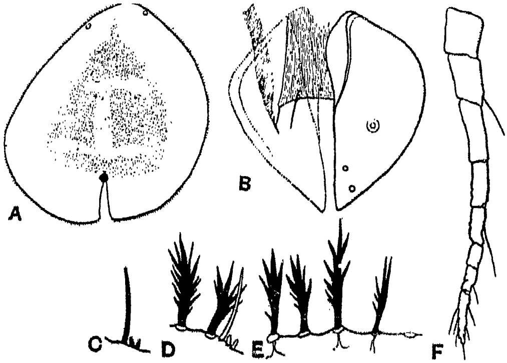
Adult female subcircular or subtriangular, moderately convex above; length approximately equal to greatest breadth; surface dull (as if coated with fungus), except for a short medio-longitudinal and two transverse ridges which are smooth and shining, of a paler tint, and sometimes demarked by a thin covering of translucent glassy secretion. Margin with a close series of prominent, dull glassy, flattened, triangular processes which are equal to from one-quarter to one-third the length of the anal cleft; each process supported by six or more of the marginal setæ. Under surface moderately concave. Average diameter 2·5 mm.

Adult female, when mounted, with eyes situated close to frontal margin. Antennæ 8-segmented, the proportions of the segments being: (1) 15, (2) 20, (3) 25, (4) 25, (5) 15, (6) 15, (7) 13, (8) 32, the last variable and sometimes subequal to (3); antennæ occasionally 7-segmented, due to the fusion of (4) and (5). Legs normal; tarsi considerably more than half the length of tibiæ. Valves of anal operculum with base short, outer margin gently curved, two subapical and one submedian setæ, and two fringe-setæ. Derm rather dense; median dorsal area with numerous minute translucent pores except for a median longitudinal and an anterior and posterior transverse band which assumes roughly an I-shaped marking; marginal area densely chitinized. Margin with a close series of short, strongly branched spines, the interspaces less than length of spines, the margin presenting a very arborescent appearance. Stigmatic clefts absent; stigmatic spines three, the median long, the other two very short. Anal cleft approximately one-quarter length of insect.

SAN THOME: Bella Vista, on *Tabernæmontana* sp. Also GOLD COAST, Aburi, on *Stenophylla* coffee (*W. H. Patterson*); KENYA COLONY, on an unidentified plant (*H. Wilkinson*); TANGANYIKA TERRITORY, Bukoba, on *Coffea arabica* (*A. H. Ritchie*); UGANDA, Nkosi I., S. Sesse, Lake Victoria, on an undetermined plant (*Dr. G. D. H. Carpenter*); Sesse Isles, on *Coffea robusta* (*H. Hargreaves*); SUDAN, Mongalla, on coffee (*W. T. R. L. Ruttledge*).

Type selected from specimens found on *Stenophylla* coffee grown at Aburi.

Fig. 11.



Ctenochiton arborescens, Laing, sp. n.

A, adult ♀, dorsal view; B, anal lobes; C, stigmatic spines; D, stigmatic spines with marginal setæ showing relative proportions; E, marginal setæ; F, antenna.

Resembling superficially *C. eucalypti*, Mask., but in that species the marginal setæ are slender. The remarkable fimbriate marginal setæ should be sufficient to distinguish the two species. From the frequency with which we have received this species in recent years, its wide distribution, and heavy infestation of the leaves, it would seem as if *C. arborescens* may assume considerable dimensions as a pest to the coffee-plant.

Pinnaspis chionaspiformis (Newst.).

After examining a series of preparations made from the original gathering of *P. chionaspiformis* and *P. cassiæ* (Newst.), I have come to the conclusion that these two species cannot be maintained as distinct.

Dinaspis annæ, Mal.

In 1917 ('Redia,' xii. p. 188, 1917) Malenotti described *Dinaspis annæ* from specimens collected on *Citrus medica acida* in Barbados. I have at hand part of this material received through Mr. E. E. Green from Malenotti's own collection, and I have also examined collections of what I believe to be the same species, all from *Citrus*, from Bermuda, Jamaica, Azores, Sierra Leone, Santo and Efate Islands, New Hebrides, and S. Africa, where the species was found on pomelos (*Citrus decumana*) imported from China, and I have come to the conclusion that *D. annæ* is not specifically distinct from what is usually known as *Chionaspis citri*, Comst. There is some slight variation in the number and disposition of the dorsal pores on the pygidium, these being rather more numerous in the Chinese specimens, especially in the lateral basal area, but the pygidial fringe is remarkably constant, except occasionally in old and worn females, the longitudinal keel of the puparium is not always too distinct, while the whitish-grey margin of the puparium may not always be discernible in those on the bark. The variations that do occur, however, are minute and well within the range of what one would expect in comparing material collected in such widely separated localities. The genotype of *Dinaspis* is *D. ischesii*, Leon., found in Argentina, and *Chionaspis citri*, Comst., forms that of *Prontaspis*, MacG. The females of these two genera are difficult to separate on morphological characters and one has to rely on the male scale; *Dinaspis* belongs to the Lepidosiphini and *Prontaspis* to the Diaspidini, as MacGillivray pointed out.

Chionaspis tursioides, sp. n. (Fig. 12.)

Scale snowy white, distinctly woolly, with low transverse ridges, widening gradually from front to rear, very highly convex in the middle, with steep, almost vertical sides, the curved back forming a sharp edge with ventral surface anteriorly and posteriorly; no ventral scale, except remnants anteriorly; exuviæ golden brown.

Length 1·3 mm.

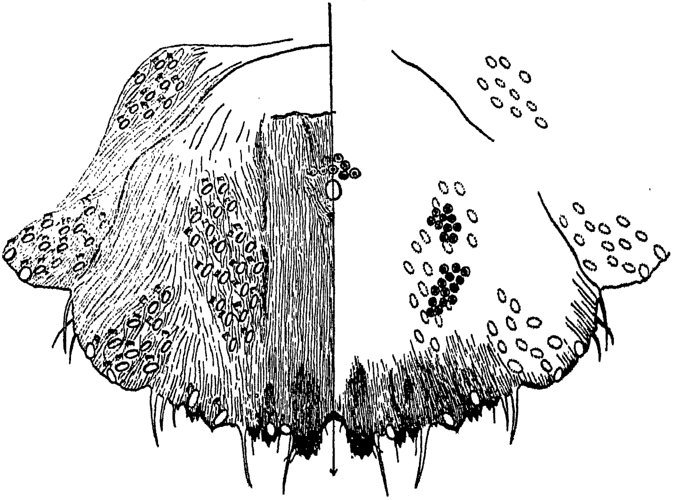
Adult ♀ very black-brown, flattish at head and pygidial ends, with the median segments highly domed. Derm clearing completely in potash. Head-end rather narrow, posterior flatly rounded, widest about the antepenultimate segment. Antennal tubercles with two strong, slightly curved setæ; spiracles without parastigmatic pores; the six prepygidial segments with a marginal group of pores, the last two with two series, an outer and an inner. Pygidium with median pair of trullæ well separated, more or less parallel-sided, with distal margin distinctly spinose; second pair of trullæ represented by twin triangular projections, both notched on outer and inner sides; margin in position of third pair of trullæ with four small conical processes, the median pair perhaps the largest; a strong spinose seta immediately beyond each pair of trullæ; a marginal gland orifice in first lateral interval, another between the bicuspid lobes of second trullæ, and one at base of each of the first three conical projections in the position of the third pair of lobes. Dorsal gland orifices in two very distinct and conspicuous groups, a lateral or posterior one of about twelve openings and an anterior median one of about twenty; perivulvar pores in five groups, the formula approximately 17 : 10 : 8 : 11 : 13.

Length 1·5 mm.

TANGANYIKA TERRITORY: Kilimanjaro, Mkuu, on a common thorn-bush (*A. H. Ritchie*).

On account of the flaccid nature of the pygidial fringe, it has been difficult to obtain preparations which show its true character clearly. The species appears to be most nearly related to *C. fici*, Newst., but differs from the latter in the shape, and distance apart, of the median trullæ, the different arrangement of the marginal gland orifices, the presence of the large median anterior group of dorsal pores, and the smaller number of perivulvar pores.

Fig. 12.



Chionaspis tursioides, Laing, sp. n.
Pygidium of ♀.

Chionaspis carpenteri, sp. n. (Fig. 13.)

Scale of adult ♀ snowy white, sides more or less straight, seldom curved, long, narrow, widening out slightly posteriorly, length in a well-developed scale at least thrice its greatest breadth; exuviæ usually overlaid with a white secretion, but larval frequently, and nymphal occasionally, bare, pale golden brown.

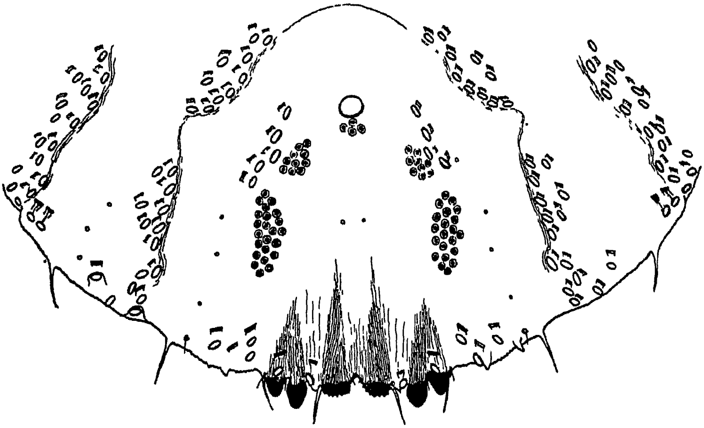
Length up to 3 mm.

Scale of ♂ white, more or less parallel-sided, occasionally widening somewhat posteriorly, tricarinate, but neither the median nor lateral ridges very conspicuous; exuviæ golden brown.

Length 0·5–0·75 mm.

Adult ♀ long, narrow, widening out gradually to prepygidial segments, about three times longer than greatest width; body soft. Antennæ consisting of one very strong, long, curved seta. A small group (six to eleven) of parastigmatic pores adjoining anterior pair of spiracles, the posterior pair lacking such pores. Lateral margins of thoracic and abdominal segments rather thickly studded with glands, these extending more sparsely on to cephalic area, and on the last few free abdominal segments tending to form incomplete transverse bands; free abdominal segments without spines. Pygidium with the median pair of trullæ divergent and flat, the front margin broad and finely serrated, interval between deep and narrow; second pair of trullæ bilobulate, each lobule spathulate in shape; margin beyond faintly serrated; a spinose seta immediately external to median trulla and second lobule and one more cephalad; a dorsal gland in the first lateral incisura, three marginal or submarginal glands in the interval between the second and third marginal seta, 4–6 dorsal glands forming the anterior group in the first position, the second arch composed of 10–13 posterior and 7–10 anterior glands, which are as a rule rather irregular and do not form a single row; perivulvar pores in five groups, with formula 20 : 3 : 5 : 11 : 24.

Fig. 13.



Chionaspis carpenteri, Laing, sp. n.
Pygidium of ♀.

Length 1·7 mm.

UGANDA: Nkosi Island, S. Sesse, Lake Victoria, on an undetermined plant (*Dr. G. D. Hale Carpenter*).

Chionaspis ritchiei, sp. n. (Fig. 14.)

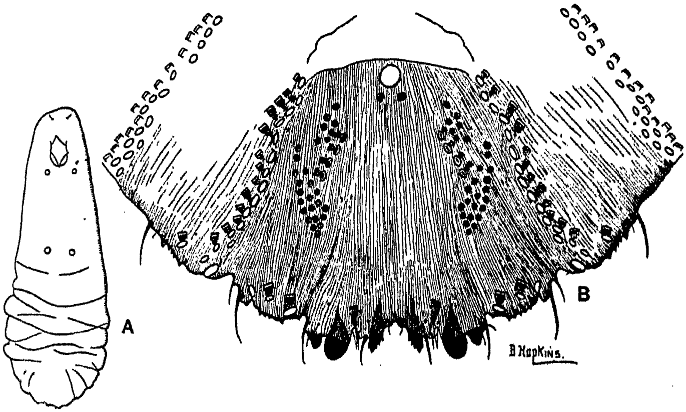
Scale of adult ♀ snowy white, slightly waxy in appearance, long, narrow, broadening out posteriorly; larval pellicle pale honey-brown, second pellicle a darker brown, overlaid in front with white. Length 2·25 mm.

Puparium of ♂ snow-white, woolly in appearance, not much longer than pellicle, rather broad posteriorly, unicarinate; larval pellicle very pale yellow-brown, dusted in places with white powder, oval, with a narrow elongate median elevation.

Length 1 mm.

Adult ♀ long and narrow, length from three to three and one-half times the breadth, widest across penultimate abdominal segment; dorsum with transverse bead-like striæ rather widely separated, ventral surface minutely spinulose and closely striated; thoracic segments long, moderately chitinized. Antennæ with two longish curved bristles. Anterior spiracles with a small group of parastigmatic pores, posterior pair with two or three, difficult to distinguish. A few pores on margin of posterior half of thoracic segments, becoming more numerous and interspersed with a few small tubercular glands on the lateral areas of abdominal segments. Median lobes of pygidium diverging, margins spinose; the second pair of trullæ composed of two lobules, the inner the larger, somewhat spathulate with evenly rounded margin, the outer more conical, with a distinct notch on outer margin; third pair of trullæ obsolete, the margin cephalad of last pair divided into a number of conical prominences and serrated; a pair of minute setæ between, a stout long one arising from the middle, and a shorter, but strong,

Fig. 14.



Chionaspis ritchiei, Laing, sp. n.

A, adult ♀; B, pygidium.

one from near the base of outer margin of median trullæ, another at outer base of second lobule, and two similar ones cephalad. Perivulvar pores in five groups, according to the formula 20:8:2:9:21. First series of dorsal gland orifices consisting of three or four anterior ones only, the two following series with anterior and posterior groups more or less coalesced to form an arch.

Length 1·84 mm.

TANGANYIKA TERRITORY: Bukoba, Bugabu, on *Coffea arabica* (*A. H. Ritchie*). SIERRA LEONE: Matin, on *Coffea liberica* (*E. Hargreaves*).

The holotype (♀) has been selected from the Tanganyika specimens, the male puparium from Sierra Leone. I have associated the material from the latter locality with the Tanganyika material, in spite of very minute differences; these consist mostly in a slightly more slender elongate shape, fewer parastigmatic pores adjoining the anterior pair of spiracles, and fewer lateral dorsal gland orifices on the free abdominal segments. *C. ritchiei* is probably most closely related to *C. usambarica*, Ldgr., but differs in the shape of the median trullæ and in other minor respects, which may be seen by a comparison of the accompanying figure with that given by Lindinger. The pygidial fringe also resembles that found in *C. dentilobis*, Newst., but, apart from the obvious difference of the absence of perivulvar pores in the latter, *C. ritchiei* has but a single arch of dorsal pores in each series, *C. dentilobis* has each arch composed of several rows. The male puparia of the two species are also amply distinct.

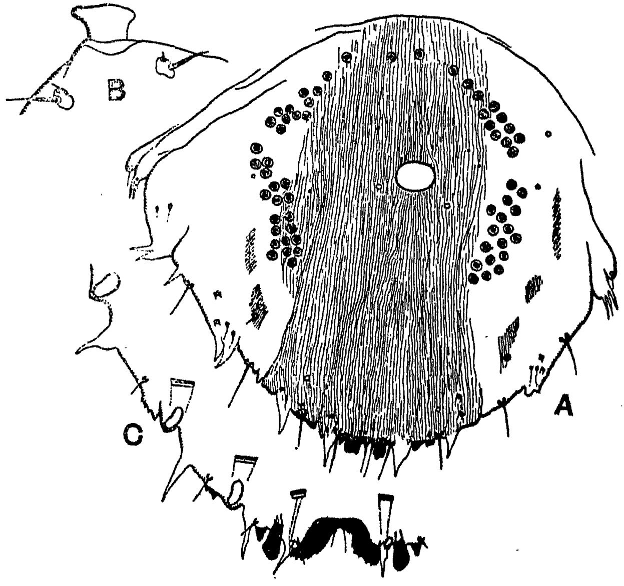
Fiorinia fletcheri, sp. n. (Fig. 15.)

Male scale snow-white, narrowly elongate, with sides more or less parallel and a single median longitudinal carina; larval pellicle pale buff. Length approximately 1 mm. Crowded together on under surface of leaf, and covered to a slight extent by a woolly secretion.

Nymphal pellicle elongate, broad at head-end, tapering gradually posteriorly, pale buff to pale brown, with a distinct median longitudinal keel of a dark brown to blackish colour; larval pellicle light brown; length 1·49 mm.; breadth 0·51 mm. Pygidium with median pair of trullæ well developed, divergent, and serrated on inner margin, the second pair bilobed, the second lobule small and somewhat conical.

Adult female enclosed entirely within second (nymphal) pellicle, narrow in front and behind, parallel-sided medianly. Antennal tubercles subquadrate, with one stout well-developed spine, and a much smaller inconspicuous seta; arising from between the antennæ is a short cylindrical process, the length of which is subequal to breadth and the apex expanded; spiracles without parastigmatic pores; margin of thorax with a row of very short spinnerets. Pygidium with a median pair of small, poorly developed, conical or quadrate trullæ, separated from each other by an interval at least equal to width of one lobe; second pair of trullæ probably represented by a broad, shallow, triangulate, sometimes bicuspid, expansion of margin; two fairly strong setæ in median interval, one external to median lobe and another external to second; a squama in first lateral interval and another external to second trulla; perivulvar pores in five ill-defined groups, either the two lateral or the anterior lateral and median groups coalescing, the formula approximately 20:11:3:12:17; spinnerets few and onfined to marginal area; dorsal surface of pygidium slightly hitinized medianly.

Fig. 15.



Fiorinia fletcheri, Laing, sp. n.

A, pygidium of adult ♀; B, antennæ and cephalic process; C, margin of pygidium of nymphal pellicle.

Length 0·8 mm.; breadth 0·46 mm.

INDIA: Pusa, on leaves of *Ægle marmetus* (*T. Bainbrigge Fletcher*).

The interantennal process of this species seems to be intermediate etween that found in *F. proboscidaria*, Green, and *F. theæ*, Green, hile the characters of the pygidial margin approach those found n *F. odinæ*, Leon.

Aspidiotus fissidens, Ldgr., var. *pluridentatus*, Ldgr.

TANGANYIKA TERRITORY: Kilimanjaro, Mkuu, on "gabilo" (*A. H. Ritchie*).

Lindinger's material came from the old German E. Africa and Mozambique, on the leaves of *Bosquiea cerasiflora*, *Sideroxylon inerme*, and *Chrysophyllum stuhlmanni*. Though I have not been able to compare these specimens with authentically named examples, Lindinger's description is sufficiently full, and the species so distinctive, that there is little likelihood of mistaking it.

Aspidiotus unguiculatus, Leon.

I have not had an opportunity to examine authentic material of *Aspidiotus unguiculatus*, Leon. (Boll. Lab. Zool. Portici, p. 199, 1914), but, judging from the description and figures, it appears to me to be a synonym of *Aspidiotus palmæ*, Morg. & Ckll. I have examined a long series of the latter species, collected in many different parts of the world, and find that the lateral thoracic tubercle, to which Leonardi refers, is present, while the length of the rostral filaments varies, especially in young females, and there does not appear to be any satisfactory character by which the two species may be separated.

Aspidiotus subchortinus, sp. n. (Fig. 16.)

Puparium of ♀ not observed.

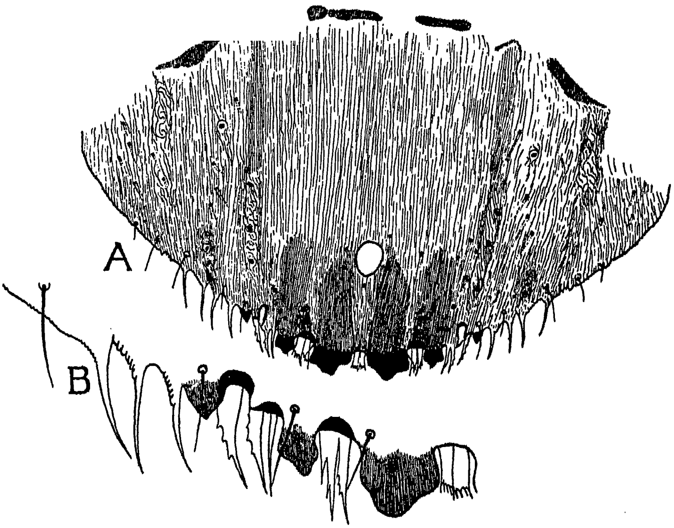
Adult ♀ broadly ovate, clearing completely in caustic potash. Antennal tubercles with a single, stout, straight seta; parastigmatic pores wanting; rather stout setæ at intervals around margin of cephalothorax and free abdominal segments, the latter also with a very few filiform spinnerets. Pygidium low and broad, the median pair of trullæ much the largest, twice as broad as long, rounded and slightly diverging apically, outer and inner margins conspicuously incised near the middle, parallel on basal half; second pair of trullæ much smaller, more conical, outer margin incised towards the apex, inner margin sometimes with a similar incision; third pair of trullæ reduced to a small triangular projection; the usual number of squamæ in the median, first and second lateral intervals, and four setiform squamæ beyond the third trulla; a few spines as shown in the figure; the margin at the intervals incrassated; dorsal pores very few and inconspicuous, two usually lying above the first lateral interval; small tubular spinnerets present, scattered throughout the whole area, but not numerous; perivulvar pores absent; four basal transverse calli.

Length 1·15 mm.; breadth 0·9 mm.

JAMAICA: Hope Laboratory, on water-grass (*Panicum* sp.) (*C. C. Gowdey*).

It is possible that this species has already been described, but we have been unable to assign it to anything known to us. Its most characteristic feature is the simple spinose nature of the squamæ lying cephalad of the third pair of trullæ. It is most closely related, I think, to *A. chortinus*, Ferris, found on *Chætochloa caudata* (Stanford Univ. Public. Univ. Series, Biol. Sci. i. no. 2, p. 123, 1921) in Lower California, but, judging from the figure given by Ferris, his species has no trace of a third pair of lobes, the spines in the interlobular areas are much stronger, nor are the margins of the latter incrassated. In view of these differences I have decided to keep the material from Jamaica distinct for the present.

Fig. 16.



Aspidiotus subchortinus, Laing, sp. n.
A, pygidium of adult ♀; B, fringe of same.

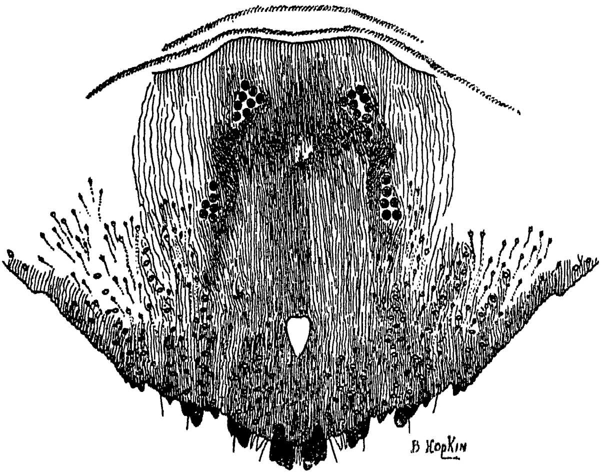
Aspidiotus kiritchenkoi, sp. n. (Fig. 17.)

Puparium of adult ♀ subcircular, highly convex, white, white with a buff tint around the margin, or entirely buff with a white area around the exuviæ; exuviæ subcentral, bottle-green in colour; ventral scale thick, white, adhering to surface of plant.

Diameter up to 1·5 mm.

Adult ♀ broadly ovate, clearing completely in caustic potash. Antennal tubercles large, with one straight longish seta, and two very short tubercular spines; both pairs of spiracles rather broad and conspicuous, without parastigmatic pores; margin of cephalic region with a few short spines; filiform spinnerets present around the margin of the head, on the median area of the thorax, and crowded on the lateral area of the free abdominal segments. Pygidium with a very irregular margin; median pair of trullæ large, well formed, rather projecting, separated by a very narrow space, the outer and inner margins parallel, entire, apex truncate with a faint median point, the base incrassated; the second and third pairs of trullæ broad at base, narrow and blunt apically, with a very deep shoulder medianly on the outer margin; in the wide interval between there is a small conical projection; beyond the third trulla there is a wide interval containing a low, more or less bicuspid tooth, followed by the projecting continuation of the margin; two spinose squamæ in the median and first lateral intervals, and one between the median conical projection in the second interval and the third trulla; a spine at the outer basal angle of the median, and at the middle of the second and third trullæ; dorsal pores numerous, small, confined mainly to double-rowed series resting on the intervals; tubular and filiform spinnerets crowded laterally; two short submedian transverse calli; perivulvar pores in four well-defined groups, each varying a little in number, an average formula being 4 : 8 : 0 : 9 : 5.

Fig. 17.



Aspidiotus kiritchenkoi, Laing, sp. n.
Pygidium of ♀.

Length up to 1·03 mm.; breadth 0·86 mm.

Odessa: on *Teucrium* sp. (holotype) and *Achillea* sp. (*A. N. Kiritchenko*).

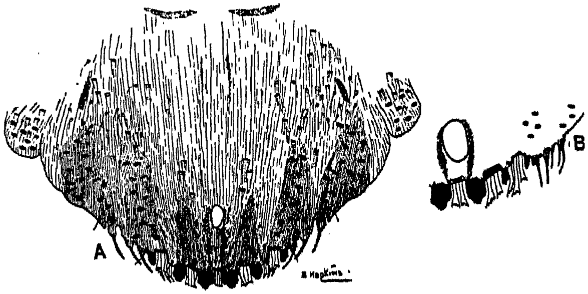
This species might quite well be regarded as a form of *A. artemisiæ*, Hall, found on *Artemisia* and *Achillea* in Egypt. In *A. artemisiæ*, if perivulvar pores are present at all, they consist of two or three in the anterior lateral group only, and that as a rule on one side; in *A. kiritchenkoi* the perivulvar pores are very distinct and in four well-defined groups. There is a very noticeable external difference between the specimens occurring on *Teucrium* and those on *Achillea*; the exuviæ of the former are green, and in the latter yellowish buff. The margin of the pygidium is subject to considerable variation, for sometimes the second and third trullæ project and form well-defined intervals, while in others they are retracted and scarcely break the line of the margin. In *A. artemisiæ*, Hall, the same condition is found to exist.

Aspidiotus andersoni, sp. n. (Fig. 18.)

Scale of adult female subcircular, greyish white, the exuviæ subcentral, nymphal pellicle very dark, almost a reddish brown, larval pale castaneous.

Diameter 1·2 mm.

Fig. 18.



***Aspidiotus andersoni*, Laing, sp. n.**
A, pygidium; B, part of pygidial margin and anal pore of *A. mitchelli*, Marl., for comparison.

Adult female as broad as long, very broadly pyriform, the cephalic region with a very broad marginal area more densely chitinized than the remainder. Antennal tubercles with a single stout seta; parastigmatic pores lacking; marginal area of the three prepygidial abdominal segments of about the same density as the pygidium itself and crowded with dorsal pores and spinnerets, both tubular and filiform. Pygidium with three pairs of trullæ, the median notched on both outer and inner margins, the second usually similar in shape but smaller, though one or both lateral notches may be worn away, third pair still smaller, the inner margin straight, the tip rounded, and outer margin sometimes notched; anal pore somewhat small; the usual number of squamæ in the intervals, those in the second lateral interval rather long, three beyond the third pair of trullæ, those long and pinnuliform; dorsal pores in two fairly well-defined groups, the inner running from proximity of third pair of trullæ, the outer lying just beyond the last squama; tubular, intermingled with a few filiform, spinnerets, numerous basally; perivulvar pores absent; four well-defined basal calli.

KENYA COLONY: on an unknown host-plant (*T. J. Anderson*); TANGANYIKA TERRITORY, on bark of *Nerium oleander* (*A. H. Ritchie*).

Type taken from material from Kenya Colony.

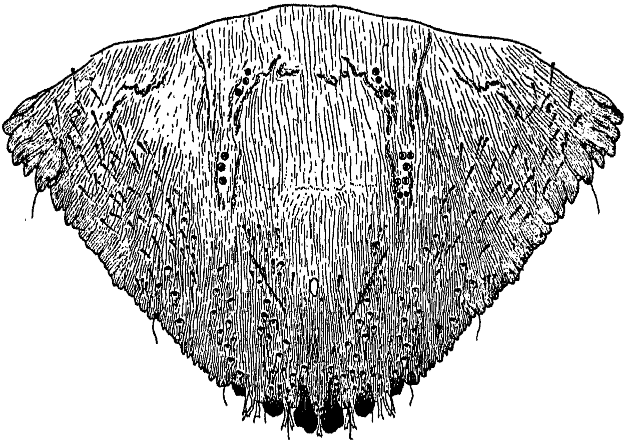
In the shape, degree of chitinization, the presence of marginal groups of pores and spinnerets on the abdominal segments, and the pinnuliform squamæ external to the third pair of trullæ, this species resembles *Aspidiotus orientalis*, Newst., but, apart from several minute characters, the absence of perivulvar pores readily distinguishes it from that species. It is most closely related, however, to *Aspidiotus mitchelli*, Marl. I am indebted to Mr. Harold Morrison, of the U.S. Bureau of Entomology, for a microscopic preparation made from the original material of the latter species, and a careful comparison reveals that *A. mitchelli* has a relatively larger anal pore, the pinnuliform squamæ are more numerous, the fimbriate squamæ in the intervals are relatively longer, the dorsal pores are fewer, the marginal pores on the prepygidial abdominal segments are either far fewer or absent, the margin has fairly strong setæ at intervals all round, and there does not appear to be any cephalic and abdominal chitinization. I have associated the specimens on the bark of *Nerium oleander* from Tanganyika Territory with the Kenya Colony material, but the former seem to have the third pair of trullæ more frequently sharply conical, the second pair smaller, and the squamæ in the intervals relatively longer, approaching in these characters to what is found in *A. mitchelli*. It is possible that the Kenya Colony material represents a more northern race of *A. mitchelli* with the Tanganyika specimens acting as a connecting-link between the two. I agree with Brain that *A. mitchelli* should not be assigned to *Hemiberlesia*.

Aspidiotus sacchari, Ckll. (Fig. 19.)

JAMAICA, on sugar-cane, Guinea grass, and water-grass (*Panicum* spp.) (*C. C. Gowdey*); BRITISH GUIANA, on sugar-cane (*H. E. Box*); SIERRA LEONE, on coconut, the stolon and exposed roots of an unknown plant, and on a grass (*E. Hargreaves*). The appearance of this species on coconut was queried by the writer, but was later confirmed by Mr. Hargreaves. The figure of the pygidium given herewith is drawn from a specimen found on water-grass in Jamaica. There is a certain amount of variation in the number of pores to each perivulvar group, the anterior laterals being particularly subject to reduction to two or three.

Merrill assigns the species to *Targionia*, but the presence of squamæ in the incisuræ precludes it from that genus.

Fig. 19.

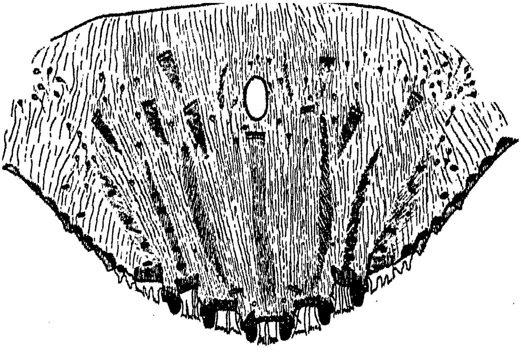


Aspidiotus sacchari, Ckll.
Pygidium of adult ♀.

Aonidiella misræ, sp. n. (Fig. 20.)

Scale of adult female low convex, subcircular, pale greyish with a few narrow brown concentric rings, greyish brown, or brownish

Fig. 20.



Aonidiella misræ, Laing, sp. n.
Pygidium of ♀.

fuscous, with a slight mealy deposit; exuviæ whitish grey, subcentral. Diameter 1·4 mm.

Adult female longish oval, narrowing rather sharply to apex of pygidium, whole body clearing completely in caustic potash. Antennal tubercles with one long curved seta; parastigmatic pores absent; margin sparsely set with short setæ. Pygidium with three pairs of well-developed trullæ, all with inner margin straight and entire, the outer with a conspicuous mesal shoulder; margin beyond last trulla produced into three sharp prominences; the outer margin of median trullæ, and both margins of the second and third pores with narrow short paraphyses; the marginal area beyond last squama cristate; intervals with usual number of squamæ, and about five small ones beyond last trulla; a uniserial row of dorsal pores arising from interstice beyond and behind third trulla; filiform spinnerets numerous basally; perivulvar pores absent; no trace of basal calli.

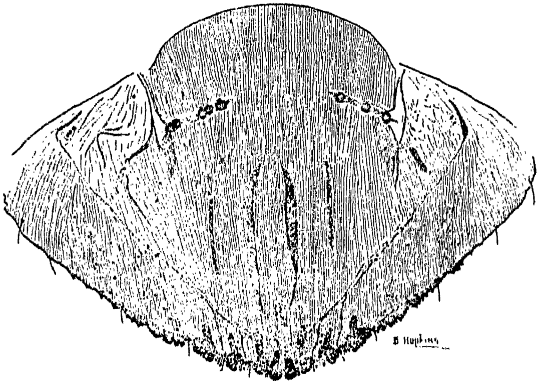
Length 1·03 mm.; breadth 0·7 mm.

INDIA: Pusa, on leaves of *Tamarindus indica* (*C. S. Misra*).

Aonidiella maurellæ, sp. n. (Fig. 21.)

Scale of adult female subcircular, rather highly convex, concentrically ridged, dull black, obscured marginally by flecks of greyish-white deposit from the bark of the plant; ventral scale entire, strong, the inner side with a broad reddish-brown border and a whitish centre; exuviæ paler than scale itself, subcentral. Diameter 1·4 mm.

Fig. 21.



Aonidiella maurellæ, Laing, sp. n.
Pygidium of adult ♀.

Adult female broadly ovate, greatest width across thorax, head-end well rounded, posterior very low conical. Antennal tubercles with one stout and one or two very minute setæ; parastigmatic pores absent; cephalic and abdominal regions with a few sublateral and marginal stout setæ, well developed circular pores, and filiform spinnerets, both the latter particularly numerous in the region of the mouth; margin of head gently undulate, that of thorax and abdomen conspicuously irregular, with well-formed conical projections. Pygidium broad, shallow, with a broad median basal piece; four pairs of trullæ, the median pair broad and flattish with rounded apices and entire margins, second pair with inner margin parallel to but longer than outer, the apical faintly toothed, the third pair similarly shaped but slightly larger, the fourth broad with the oblique apical margin serrated; all the trullæ with strong, deep, basal incrassations, those of second pair the longest; margin beyond fourth pair of trullæ produced into a series of triangular or conical projections; squamæ present in first and second intervals, very small and inconspicuous; anal pore small; dorsal pores few and small; perivulvar pores absent; two pairs of basal chitinous calli, the submedian pair made very conspicuous by three to five circular thickenings.

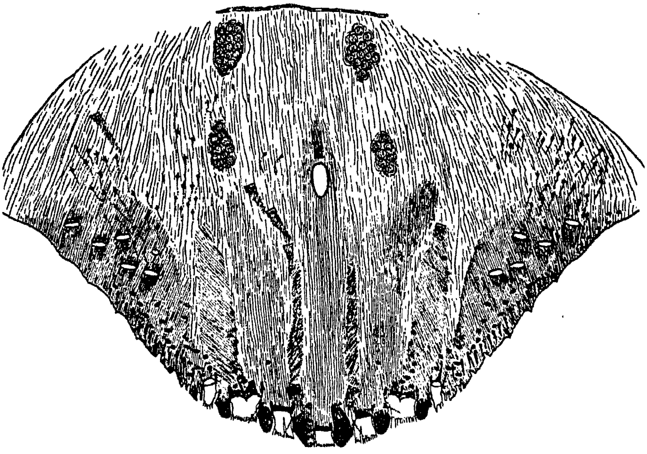
Length 1 mm.; breadth 0·86 mm.

Colombia: Tucurinca, on the bark of an unspecified plant (*C. C. Gowdey*).

Chrysomphalus rossi (Mask.).

The distribution of *Chrysomphalus rossi* (Mask.) presents a problem in variation. Australian specimens have the ♀ puparium an exceedingly dark brown, so deep that Maskell originally described it as "intensely black," and Crawford, according to Maskill, when he first came into possession of specimens, proposed the specific, but preoccupied, name of *niger*. In India, Ceylon, and the Philippines the colour varies, Mr. Green tells me, from whitish, through reddish brown, to blackish. The dorsal pores of the pygidium are found to differ very distinctly when a long series of preparations are examined. In Australian and New Zealand examples the pores are large and relatively few in number, especially marginally-medianly, a character which seems to be very constant. In the Ceylon form (named by Brain and Kelly var. *greeni*) the pores are much smaller and more numerous, while in Indian specimens they are also small but much fewer in number. I add below a couple of what appear to be very distinct forms, and here the illustrations show how crowded the pores are, giving the pygidium a very distinctive appearance. The number of squamulæ cephalad of the third pair of trullæ seems to be constant in typical *rossi*, namely one, with the two following hardened and chitinized but still retaining some semblance of their squamate origin; in the lighter-coloured, non-Australian, forms the number of squamulæ in this position may be either one or two, with the one or two following, as the case may be, chitinous, but apparently constant. The Tropical African forms of so-called *C. rossi* are akin to the Indian or Ceylon forms and not to the Australian—that is to say, they belong to the type with the small pores, with the addition, in most cases, of a thoracic process varying in the degree of development. *Chrysomphalus opimus*, Silv., found on olive in Eritrea, belongs to this complex, and, though it has no thoracic process, the pentagonal shape may be regarded as an intermediate stage between *C. rossi*, var. *greeni*, Brain & Kelly, found in Ceylon and S. Africa, and var. *ferrandii*, Malen., found in Italian Somaliland, or the variety *colæ* described below. Through the kindness of Professor Silvestri I have been able to examine his type-slide of *C. opimus*, and I give a figure of the pygidium to show the structure (fig. 22); the most noticeable features are the five large latero-marginal glands and the chitinization which has taken place at the base of the median trullæ, causing the disappearance of the median paraphyses; the dorsal pores are small and few in number. It seems to me that the name *rossi* should be confined to the Australian form with the large dorsal pores, and the type with the small pores treated as distinct, but for the moment I am not in a position to say whether either or both of the varietal names *ferrandii* or *greeni* should be raised to specific rank, and until I have had an opportunity to examine the necessary material I am assigning, conservatively, the two very distinct forms, described below, to *C. rossi*. I have added detailed drawings of the distribution of the dorsal pores, but, for the sake of clarity, those along the serrated margins have been omitted.

Fig. 22.



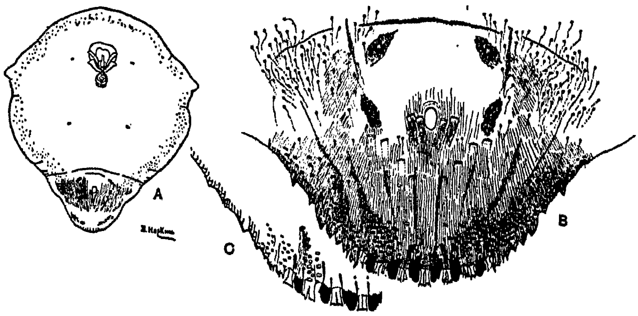
Chrysomphalus opimus, Silv.
Pygidium of adult ♀.

Chrysomphalus rossi, Mask., var. *musæ*, nov. (Fig. 23.)

Puparium of ♀ subcircular, very low convex, grey-brown in colour, finely serrated concentrically; exuviæ subcentral, shining black. Diameter 2·5 mm.

Adult ♀ pyriform, not quite as broad as long, with, on each side of the thorax, a prominent, blunt, soft protuberance. Antennal tubercles with a single long curved seta; spiracles without parastigmatic pores; a few scattered setæ marginally and submarginally; magin of abdominal segments with filiform spinnerets, these more numerous on the posterior area. Pygidium with three pairs of trullæ, each pair trowel-shaped, each with a distinct basal incision on outer margin, inner margin entire; the usual number of fibriate squamæ in the intervals between the trullæ, and one immediately beyond the third pair, the next two chitinous bicuspid processes, the margin thereafter produced into five triangularly conical teeth, forming a serrated edge; paraphyses long and slender, one to the inner and outer margins of each trulla, one at the middle of the second lateral interval, and a row, gradually shortening in length, beyond, starting from second bicuspid projection; filiform spinnerets crowded laterally at base of pygidium; perivulvar pores in four compact groups, the formula being 10 : 11 : 0 : 11 : 11; two series of sublateral dorsal pores, each crowded marginally, the first springing from the second interval, the other from between the third trulla and the beginning of the serrated margin; dorsal glands also present along the serrated margin.

Fig. 23.



Chrysomphalus rossi, var. *musæ*, Laing, nov.
A, adult ♀; B, pygidium; C, fringe of pygidium.

Length 1·3 mm.; breadth 1·1 mm.

TANGANYIKA TERRITORY: Bukoba, Kamachumu, on banana (*A. H. Ritchie*).

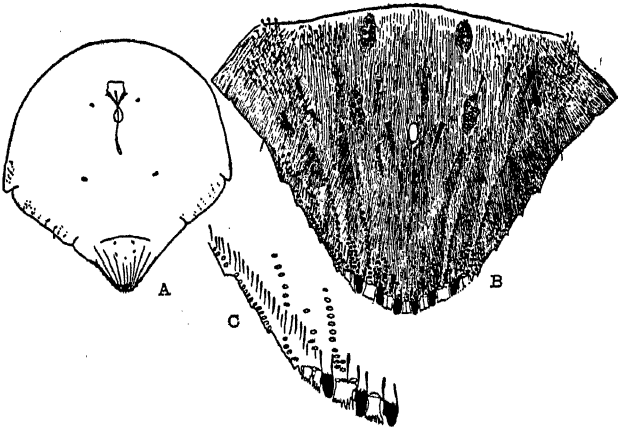
The position and the size of the thoracic process are sufficient to distinguish this variety. In the presence of but one fimbriate squama and two partially chitinized bicuspid processes cephalad of the third part of trullæ, it resembles typical *C. rossi.*

Chrysomphalus rossi, Mask., var. *colæ*, nov. (Fig. 24.)

Puparium of adult ♀ varying from greyish white to greyish brown, subcircular; exuviæ subcentral, shining black, the second wholly covered with a thin whitish or pale greyish deposit, the first with a broad belt of white secretion around the periphery. Inner surface dull black; ventral scale persisting around margin. Diameter up to 2·5 mm.

Puparium of ♂ whitish, or brownish white with a whitish margin; exuvia subcentral, black, with a thin white secretion in places. Diameter 1·5 mm.

Fig. 24.



Chrysomphalus rossi, var. *colæ*, nov.

A, adult ♀; B, pygidium; C, fringe of same.

Adult ♀ pale brown, tumescent, the pygidium somewhat retracted. Completely clearing in KOH; pyriform; breadth subequal to length; margin of thoracic region immediately in front of free abdominal segments produced into a backwardly directed tuberculate process; antennal tubercle with a single, almost straight, stoutish seta; parastigmatic pores absent; posterior pair of spiracles rather strongly chitinized; lateral area of thorax and free abdominal segments with a few filiform spinnerets. Pygidial characters very similar to those of *C. rossi*, var. *musæ*, but there are two fimbriate squamæ beyond the third pair of trullæ; the arrangement of the dorsal pores is the same; formula for perivulvar pores 7 : 7 : 0 : 8 : 8.

Length approximately equal to breadth, 1·5 mm.

Siera Leone: Yandu, crowded on upper surface of leaves of Kola (*E. Hargreaves*).

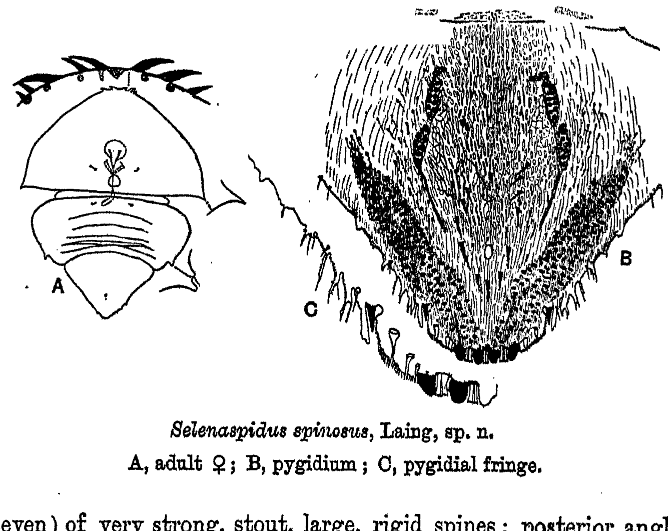
This variety approaches most closely *C. rossi*, var. *ferrandii*, Malen, described from Italian Somaliland; both have a posterior thoracic process. The Somaliland variety has, however, five groups of perivulvar pores and the shape of the squamæ beyond the third pair of trullæ differs, as a comparison of the figure given here with that of Malenotti's ('Redia,' xi. Tav. viii. fig. 12) will show.

Selenaspidus spinosus, sp. n. (Fig. 25.)

Puparium of ♀ not observed.

Adult ♀ highly chitinized, rigid, pyriform, greatest breadth across posterior of cephalothorax, the lateral incision deep and wide. Cephalothorax narrowing in front; frontal margin with a number (seven) of very strong, stout, large, rigid spines; posterior angles ending in a pronounced point; marginal area with a broad belt of minute rectangular tessellations, interior to which are, dorsally, minutely setulose patches, the remainder of the surface finely striated. Margin of fused portion of abdomen, immediately in front of free segments, with a large blunt gland-bearing tubercle,

Fig. 25.



Selenaspidus spinosus, Laing, sp. n.

A, adult ♀; B, pygidium; C, pygidial fringe.

above which lies a seta; surface marked similarly to that of cephalothorax, the striations laterally being sometimes finely serrated. Both pairs of spiracles small, inconspicuous, without parastigmatic pores. Pygidium with two pairs of trullæ, median pair subrectangular, outer margin notched mesally, second pair with outer margin sloping outwards and notched towards base; third pair of trullæ modified to form a spiny process or spur; two narrow pectinate squamæ in the median and second interval, three in the third, the first of which is narrow, the third slipper-shaped, broad apically, narrowing to about half basally; squama adjoining spur entire, narrow, elongate, outer margin irregularly serrated; other five narrow, deeply divided, irregularly shaped squamæ cephalad; dorsal pores crowded, in three irregular and poorly defined series; filiform spinnerets numerous basally, tubular spinnerets present but not so plentiful, and confined more or less medianly; median dorsal area in front of anal pore ornamented by an irregular lattice-work, the lacunæ mainly long and narrow, but neither the patch nor the lacunæ so well defined as in *Pseudaonidia*; four dorsal and six ventral basal calli, and between the submedian and lateral dorsal callus on either side is another less dense chitinous bar; perivulvar pores in four groups, posterior-laterals with 6–7 openings, the anterior-laterals with 9–11.

Length 1·3 mm.; breadth 1·05 mm.

Described from a single perfect specimen.

SIERRA LEONE: Kogbotama, on banana (*E. Hargreaves*).

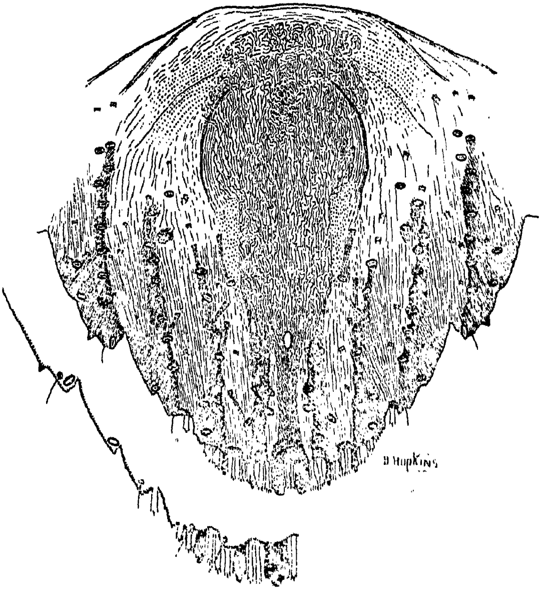
In the characters of the pygidial fringe, this species appears to be most closely allied to *S. ferox*, Ldgr., but the very prominent frontal spines as distinct from the marginal tubercles should readily serve to distinguish *S. spinosus* from that species. It is worth while drawing attention to the presence of the incipient lattice-work patch on the dorsum of the pygidium, a character which is not without significance in showing the close relationship which exists between the genera *Selenaspidus* and *Pseudaonidia.*

Pseudaonidia baikeæ, Newst. (Fig. 26.)

SIERRA LEONE: Yandu, on the under surface of the leaves of Kola (*E. Hargreaves*).

Newstead's specimens occurred on *Baikea insignis* and an unknown plant, at Entebbe, Uganda. He compares his species with *P. trilobitiformis* (Green). In the shape of the pygidial fringe, however, *P. baikeæ* approaches more closely the condition found in *P. curculiginis* (Green), but the latter has a fourth pair of lobes and perivulvar pores. I give a fresh figure to replace that illustrating Newstead's description, as his is neither quite accurate nor very complete. The dorsal patch has very irregular, elongated, narrow lacunæ, as the artist has tried to depict in the figure. Old females become very highly chitinized and rigid, and the structural details are more difficult to see.

Fig. 26.



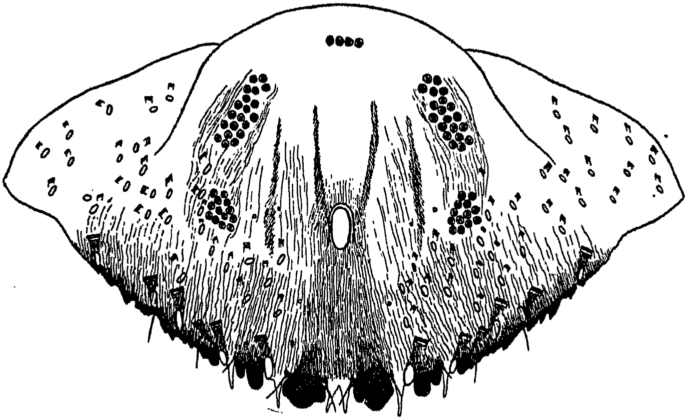
Pseudaonidia baikeæ, Newst.
Pygidium and its fringe.

Pseudoparlatoria ostreata, Ckll. (Fig. 27.)

JAMAICA: on *Pelargonium, Papaya, Solanum, Acalypha, Bauhinia, Eranthemum bicolor*, and two unknown host-plants at Gordon Town and Hopedale.

There appears to be a slight variation in the shape of the second trulla; usually it is partially bilobed, but occasionally the broad apical margin may be entire but irregularly dentate. The position and number of the dorsal pores are also subject to considerable variation. Cockerell, in his original description, stated that the perivulvar pores were in four groups. I have examined long series from different host-plants and also some specimens taken from the original gathering and presented to the collection by Cockerell, and found that there are always five groups of perivulvar pores, the median group being few (4–5) and occasionally coalescing with either the right or left hand anterior laterals; sometimes, too, the anterior and posterior laterals may be fused. As the species has not been illustrated before, I give a figure of the pygidium.

Fig. 27.



Pseudoparlatoria ostreata, Ckll.
Pygidium of adult ♀.

Lepidosaphes punicæ, sp. n. (Fig. 28.)

Scale of adult female elongate, narrow, mytiliform, generally more or less straight, but occasionally slightly curved or twisted; colour varying from castaneous brown or a very deep reddish brown

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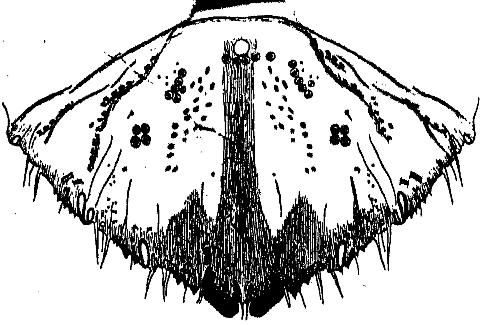

Lepidosaphes punicæ, Laing, sp. n.
Pygidium of ♀.

to almost a dull black; some whitish deposit at the sides, spreading sometimes on to dorsum; exuviæ golden brown. Length in well-developed individuals 2 mm.

Adult female obovate, widest across last abdominal segments, slightly more than thrice as long as wide, clearing completely in potash. Antennal tubercles with one stout and one short seta; anterior spiracles with two parastigmatic pores, posterior without; rostral setæ long and well developed; margin of abdominal segments without pores, the last one or two segments with a few marginal spinose setæ. Pygidium with median pair of trullæ strongly developed, the inner margins straight, diverging slightly apically to form a rounded curve to the long, oblique, serrated outer margin; the second pair of trullæ consisting of a pair of triangular sharp-pointed tubercles, the inner one slightly the larger and sometimes bicuspid; the margin, in the position of the third pair of trullæ, with about five small triangular teeth, the margin beyond the next interval again serrated; two spinose squamæ and a seta in each of the second and third intervals; outer margin of median trullæ incrassated at base; marginal gland orifices few but conspicuous; anterior submedian series of dorsal pores; perivulvar pores in five groups according to the formula 4:6:4:5:4.

Length 0·86 mm.; breadth 0·28 mm.

TANGANYIKA TERRITORY: Dar-es-Salaam, Indian Mosque, on *Punica granatum* (*A. H. Ritchie*).

This species is most closely related to *Lepidosaphes hawaiiensis* (Mask.), but differs in the pygidial fringe characters, as a comparison of the figure given here with that given by Green (Ann. & Mag. Nat. Hist. (10) i. p. 153, 1928) will show; in particular, the very strong inwardly projecting processes of the median trullæ in *Lepidosaphes hawaiiensis* are replaced, in *L. punicæ*, by a small outer and inner basal incrassation, while the margin beyond is produced into several chitinous triangular projections.

LVI.—*Oxford University Greenland Expedition*, 1928.—*Trichoptera and Ephemeroptera of Greenland: Additional Records made by the Oxford University Expedition to Kugssuk, Godthaab Fjord, W. Greenland*, 1928. By MARTIN E. MOSELY, F.E.S.

UNTIL McLachlan published his 'Trichoptera Britannica' in 1865, and in 1874–84 the 'Monographic Revision and Synopsis of the Trichoptera of the European Fauna,' few collectors paid very much attention to this order. It is not therefore surprising that records from far-off Greenland are scanty in the extreme, notwithstanding the fact that the Lepidoptera and other more popular groups have furnished comparatively long lists of extreme arctic species.

Of the older naturalists, Otho Fabricius is the first to make a Trichoptera record from Greenland, and we have *Phryganea rhombicus*, L., in his 'Fauna Groenlandica' as early as 1780.

Then Zetterstedt, in 1840, describes a new species—*Grammotaulius interrogationis*, Zett.—from the west coast.

Next comes Kolenati, who, in his 'Genera et species Trichopterorum,' 1848, records variety β of the above species. This was taken by Westermann, Zetterstedt, Tinemann, and Parreyss. In the same work he also records *Limnophilus griseus*, L., taken by Westermann, and *Limnophilus planifrons*, Kol., by Tinemann.

Then there is an interval of thirty-five years, until, in 1883, *Limnophilus griseus*, L., again turns up, nine specimens now in the Copenhagen Museum having been taken by Kolthoff at Julianehaab, Igaliko Fjord, and Ivigtut. In the same expedition Kolthoff secures eleven examples of *Limnophilus nebulosus*, Kirby, from Ivigtut, Semiliarsuk, and Neriak. Kolthoff also takes *Apatania arctica*, Boh., at Julianehaab and at Auleitsivik.

Meinert, in 'Videnskabelige Meddelelser,' 1896, pp. 157–8, states that from various localities larvæ and cases have been taken which he doubtfully refers to *Halesus radiatus*, Curt. But the difficulty of determining species in the Trichoptera, and particularly in the family of the Limnophilidæ, from the larval form is so real that it would be inadvisable to accept this record without confirmation by the capture of the adult—the more so as it is improbable that *H. radiatus* has so northern a range.

In 1889 *Apatania arctica* again turns up at Ivigtut. In 1897 van Hoeffen takes a species of *Apatania* in West Greenland which Kolbe distinguishes from *arctica* under the name of *groenlandica*. The description of this new species is not very clear and no figures are given; but Kolbe states that both sexes were found, which should distinguish it from *arctica* of which only the female is known.

In 1907 Nielsen records *Apatania arctica* again and, finally, we have the new records made by Major R. W. G. Hingston on the Oxford University Expedition to Kugssuk, Godthaab Fjord, in 1928. Major Hingston confirms once more the records of *Apatania arctica*, Boh., and *Limnophilus griseus*, L., and adds no fewer than four species to the meagre list:—*Limnophilus elegans*, Curt., *Limnophilus miser*, McL., a new *Limnophilus* species described in this paper as *hingstoni*, and, finally, a female *Grammotaulius sibiricus*, McL.

It is, perhaps, to have been expected that the Limnophilidæ should be the most extensively prevalent family in Greenland, having regard to the preponderating number of its species (of the 474 species described by McLachlan in his Monograph no fewer than 176 are Limnophilidæ) and its far-northern range. But it is, perhaps, noteworthy that the Greenland known species should belong exclusively to this family.

In the Danish report on Greenland, published by the Commission for the Direction of the Geological and Geographical Investigations in Greenland, 1928, it is stated that in Nordost Bay "there are rounded mountains and plateaux rising to about 3000–6000 ft. sloping slightly in the direction of the sea and *frequently* covered with glaciers." No doubt similar conditions are present in other districts.

This description suggests that there may be considerable areas free from ice and with, perhaps, sunny slopes and no doubt springs rising in small depressions, with possibilities of a more representative Trichopterous fauna than has hitherto been recorded. Moreover, in certain areas there are hot or rather warm springs which are flowing all the year round at a temperature of about 40°. These would form a habitat for species which require a longer period of moderate temperature for their development.

The physical conditions of the area explored by Major Hingston, consisting of low hills, with streams, marshes, and tarns, suggest that a few species at least of the Phryganeidæ might also occur, since Hagen, in his 'Synopsis of the Neuroptera of North America,' records Phryganeidæ in districts as far north as Hudson's Bay. It may, however, be possible that Greenland lies beyond the extreme range of this family.

Major Hingston writes of the districts explored by the Expedition that the hills rose to 600 feet, that most of the pools were less than 100 yards wide, and that in the bogs there was a luxuriant vegetation consisting of sedge, cotton-grass, and other water-plants.

The species taken were all found at the altitudes of 30 and 200 feet, and as the hills were thoroughly worked to their 600 feet summits, we may assume that Major Hingston's collection is fairly representative of the Trichoptera of the Godthaab district, for the methods of collecting adopted were very thorough, and he seems to have left no place unsearched and no likely method of collecting untried.

But it is evident, if only from the additions made by Major Hingston to the Greenland Trichoptera records, that the list has still possibilities of expansion, and no doubt if collectors as capable as Major Hingston were to explore other regions of the Greenland coast, keeping the habits of the Trichoptera in mind, still further additions might be made.

The species most largely represented in the collection of the Expedition is *Limnophilus miser*, McL. There were taken in all 18 ♂ ♂ and 29 ♀ ♀ between the 16th and 28th of July, all at the altitude of 30 feet. The examples in the British Museum collected in Iceland seem exactly similar to the Greenland form.

A good series was taken of *Limnophilus elegans*, Curt., of which there are 4 ♂ ♂ and 2 ♀ ♀ captured between the 20th of June and the 16th of July, also at 30 feet. The Greenland insect is a very strongly marked form. The ground-colour, stramineous in British examples, is here light chocolate, and the pale areas are of a creamy white, which makes a striking contrast against the dark background. There appears to be no structural difference between the two forms.

Major Hingston captured a ♀ *Limnophilus griseus*, L., on the 26th of June at 30 feet, and at the same altitude one ♂ on the 1st, another ♂ and two ♀ ♀ on the 3rd of July of a new *Limnophilus* described below as *Limnophilus hingstoni*, sp. n.

On the 16th of July a ♀ *Grammotaulius sibiricus*, McL.*, was taken on the 30-foot line—a very pale example with but lightly mottled wings.

On the 7th July two examples of *Apatania arctica*, Boh., were taken at the altitude of 200 feet, one on the 12th, three on the 16th, and one on the 28th at 30 feet, seven in all, and, as is usual in this species, all are ♀ ♀.

DESCRIPTION OF THE NEW SPECIES.

Family **Limnophilidæ.**

Limnophilus hingstoni, sp. n. (Figs. 1–4.)

Head clothed with black hairs. Basal joint of the antenna long, very dark; remaining joints dark brown annulated with yellowish brown; palpi yellowish brown; thorax dark brown clothed with black hairs; anterior wings elongate, slightly dilated towards the apex, the ground-colour light brown with numerous pale spots. There is a pale area extending between the costa and subcosta from the base of the wing nearly to the pterostigma and another around the anastomosis. A pale space slants backward from the lower branch of the sector level with the middle of the discoidal

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* See Addendum, p. 508.

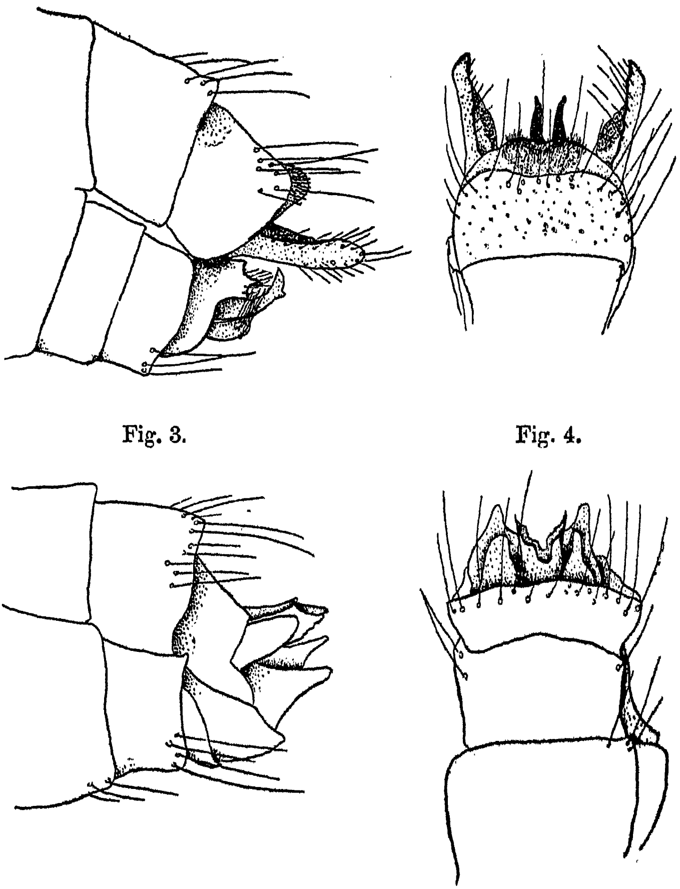

Fig. 1. Fig. 2.

Fig. 3. Fig. 4.

Limnophilus hingstoni, sp. n.

Fig. 1.—Male, from the side.
Fig. 2.—Male, dorsal.
Fig. 3.—Female, from the side.
Fig. 4.—Female, dorsal.

cell as far as the lower branch of the upper cubitus; discoidal cell long and narrow, longer than its foot-stalk. Posterior wings hyaline; discoidal cell long and narrow. No beard in the ♂. Legs yellowish brown with black spines.

In the ♂ the margin of the last dorsal segment is slightly excised, bearing at its extremity a triangular brown patch densely clothed with short dark hairs. The base of this triangle is slightly excised and lies along the margin of the segment.

Superior appendages long and straight, widely divergent, concave, dilated on the lower and inner margins towards the base, and with blackened edges; tips acute and slightly turned in, deeply blackened internally, slightly externally. Intermediate appendages very black, and viewed dorsally their bases dilated, with the tips rounded and slightly divergent. Viewed laterally they are seen to be very deep at the base, narrowing to a point and curving slightly downwards. Side-pieces yellowish, the apex three-pointed, the centre point being the longest. Inferior appendages not visible; penis yellow, curving upward, with a small projecting angle on the lower surface towards the extremity; sheaths yellow and strongly fringed. No ventral teeth.

In the ♀ the margin of the last dorsal segment is straight, appendages short and stout, extending not quite so far as the tubular piece, bases yellow, apices brown; tubular piece deeply excised both dorsally and ventrally. Dorsally its internal margin sharply elbowed towards the middle; seen from the side, side-pieces of the ninth ventral segment broad at the base, narrowing suddenly to the apex, extending further than the tubular piece. No ventral teeth.

Length of body, ♂ 8, ♀ 7 mm.; expanse, ♂ 24, ♀ 20 mm.

♂ type, ♂ and 2 ♀ ♀ paratypes in the collection of the Hope Museum, Oxford.

This species must be very closely allied to *L. harrimani*, Banks, taken on the Harriman Alaska Expedition and described in the Proc. Wash. Acad. Sci. vol. ii. pp. 465–476 (1900), but there seem to be slight differences in the neuration. In the absence of a description of the genitalia of *L. harrimani* it would not be safe to refer Major Hingston's capture to this species. Comparison with the original type will no doubt throw further light on the subject.

EPHEMEROPTERA.

If the records of the Trichoptera are scanty, those of the Ephemeroptera are negligible. The single species of this order known in Greenland is *Baëtis tenax*, Etn., recorded by Zetterstedt on the east coast.

A ♀ subimago of the same genus was taken by Major Hingston at Kugssuk on the 17th July at an altitude of 30 feet, but is undeterminable as to species in the absence of the male imago.

LIST OF RECORDED SPECIES OF TRICHOPTERA AND EPHEMEROPTERA.

TRICHOPTERA.

LIMNOPHILIDÆ.

Grammotaulius interrogationis, Zett.
—— ——, Kol., nec Zett., var. β.
**—— *sibiricus*, McL.
†*Limnophilus* (*Phryganea*) *rhombicus*, Linné.
—— *planifrons*, Kol.
*—— *griseus*, L.
—— *nebulosus*, Kirby.
**—— *elegans*, Curt.
**—— *miser*, McL.
**—— *hingstoni*, sp. n.
**Apatania arctica*, Bohem.
—— *groenlandica*, Kolbe.

EPHEMEROPTERA.

Baëtis tenax, Etn.

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* Taken by Major Hingston on the 1928 Expedition.

** Taken by Major Hingston on the 1928 Expedition; new record.

† *L. rhombicus* is omitted by Henriksen and Lundbeck from their list of Greenland Trichoptera. Dr. Esben-Petersen agrees with me that there is no adequate reason for doubting the correctness of Otho Fabricius's determination. Accordingly I reinstate it in the list.

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ADDENDUM.

After the completion of this paper I received from Dr. Esben-Petersen an example of *Grammotaulius interrogationis*, Zett., from Greenland, ex coll. Klocker. The position as to this species is somewhat confused, and as no recent description has been published or the genitalia figured it is very desirable that particulars of this comparatively unknown insect should be placed on record.

Kolenati, in his 'Genera et Species Trichopterorum,' gives a description of *interrogationis*, Zett., var. *β*, from Lapland and Greenland. McLachlan considered that the examples from the two countries were distinct, and he subsequently created a new species—*signatipennis*—in which he placed the Lapland form, suggesting that the true *interrogationis*, Zett., from Greenland, was in all probability different. Dr. Petersen's example is certainly distinct from *signatipennis*, though very near to it in the pattern of the genitalia, but the possibility cannot be ruled out that it may be Kolenati's var. *β* from Greenland. There is the further possibility that Major Hingston's ♀ *Grammotaulius*, although agreeing in every particular with McLachlan's description and figures of *sibericus*, may be actually the ♀ that should be referred to Dr. Petersen's species, for the differences in genitalia of the ♀ sex in *Grammotaulius* are very obscure.

Description of Grammotaulius interrogationis, *Zett.*
(Figs. 5 & 6.)

Head and palpi ochraceous, eye-margins and pronotum the same colour; antennæ slightly darker; legs ochraceous, with fuscous markings on the underside of the femora; abdomen, the dorsal tergites, and the posterior edges of the ventral tergites fuscous, remainder ochraceous; anterior wings pale stramineous, with small darker freckles grouped chiefly along the nervures, which are darker than the ground-colour; posterior wings greyish, with a shade of stramineous towards the apex.

In the ♂ the superior appendages from above are broad at the base, triangular in shape, the inner edges crenulate; from the side the outer margins appear coarsely crenulate and blackened, slightly concave, the lower end terminating in a blunt black tooth. Intermediate appendages very small, lying deep in the cavity of the superior appendages, not visible from either dorsal or lateral aspects; from in front they are seen to be triangular in shape, joined to the segment at the apex of the triangle, with the bases inclining towards and lying parallel with each other, edges thickened but not blackened. Inferior appendages ochraceous, small, and triangular.

Fig. 5.

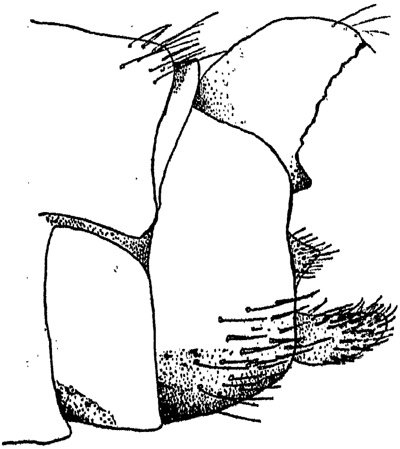
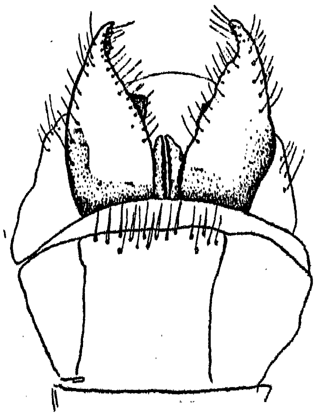


Fig. 6.



Grammotaulius interrogationis, Zett., ♂.

Fig. 5.—From the side.
Fig. 6.—Dorsal and slightly from in front; penis and sheaths not shown.

In the example from Dr. Petersen's collection the penis and its sheaths are somewhat exserted. They are not shown in the dorsal figure.

The above species is evidently very closely allied to *signatipennis*, McL., or Kolenati's var. *β* from Lapland.

LVII.—*Notes on the Myctophid Fishes of the Genera* Diaphus *and* Myctophum *in the British Museum (Natural History).* By J. R. NORMAN.

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In the course of my work on the oceanic fishes collected by the 'Discovery' Expedition I have had occasion to examine all the specimens of the family Myctophidæ in the British Museum collection. This family has been recently revised by Parr*, and a preliminary synopsis of the North Atlantic species has been published by Tåning†. The following notes may be regarded as supplementary to their reports. The figures have been drawn by Lt.-Col. W. P. C. Tenison, D.S.O.

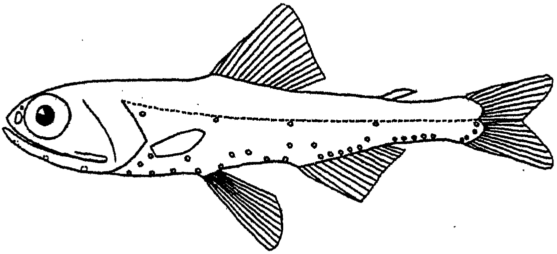
DIAPHUS, C. H. & R. S. Eigenmann, 1891.

Diaphus agassizii, Gilbert, 1908. (Fig. 1.)

Scopelus dumerilii (*non* Bleeker), Günther, 'Challenger' Deep-Sea Fish. p. 198 (1887).
Diaphus agassizii, Gilbert, Mem. Mus. Comp. Zool. xxvi. 1908, p. 226, pl. ii.; Mem. Carnegie Mus. vi. 1913, p. 85.
? *Myctophum* (*Diaphus*) *lacerta* (part.), Brauer, 'Valdivia' Tiefsee-Fische, p. 214, figs. 132–135 (1906).

Depth of body about 5 in the length, length of head $3\frac{2}{5}$. Snout less than $\frac{1}{2}$ diameter of eye, which is $2\frac{1}{3}$ in length of maxillary, about equal to interorbital width, and a little more than 3 in length of head. Dorsal 15; origin opposite root of

Fig. 1.



Diaphus agassizii, Gilbert, 1908. × 1.

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* Bull. Bingham Ocean. Coll. iii. art. 3 (1928).

† Vid. Medd. Dansk nat. For. lxxxvi. 1928, p. 49.

pelvic, a little nearer adipose fin than tip of snout. Anal 15; origin behind last dorsal ray. Pectoral 14 (?). Pelvic 10. 37 scales in a longitudinal series. There is a minute upper antorbital luminous organ above each nostril; no lower antorbital, and apparently no supraorbital or infraorbital organs. PLO very close to lateral line, without a luminous scale. 2 PVO, the lower well below level of pectoral base. 5 PO, the fourth much elevated. VLO nearly in contact with lateral line. 5 VO, the second and third on the same level and elevated above the remainder. 2 SAO, the lower level with first AO and nearer to the last VO than to the upper, which is in contact with lateral line. 7+5 AO; first anteroanal elevated and nearly above the second, last also elevated; posteroanals all level and behind the anal base. Pol almost in contact with lateral line. 4 Prc, forming a curved line. No luminous patches on caudal peduncle.

Hab. Marquesas and Fiji Islands; Japan.

Described from a single specimen, 65 mm. in length *, from Matuku, Fiji Islands, 315 fath. ('Challenger' Expedition).

The specimen described above differs in some respects from Gilbert's diagnosis of *D. agassizii*, but I have hesitated to regard it as a new species, as his specimens were all under 26 mm. in length. The type from the Marquesas Islands was 21 mm. long.

Diaphus dumerili (Bleeker, 1856).

A single specimen, 53 mm. in length, from off S.W. Ireland (52° N., 12° W.).

Diaphus garmani, Gilbert, 1906.

Diaphus garmani, Gilbert, Bull. Mus. Comp. Zool. xlvi. 1906, p. 258, pl. ii.; Tåning, Vid. Medd. nat. For. lxxxvi. 1928, p. 61; Parr, Bull. Bingham Ocean. Coll. iii. (3) 1928, p. 145, fig. 33.

Diaphus malayanus, Weber, Fische 'Siboga' Exped. p. 89, fig. 30 (1913).

Myctophum malayanum, Weber & Beaufort, Fish. Indo-Austral. Arch. ii. 1913, p. 171, fig. 65.

Hab. North Atlantic; West Indies; Ceylon; Malay Archipelago.

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* Measured to base of caudal.

Two specimens, 54 to 56 mm. in length, from Ceylon (Colombo Museum).

There is little doubt that *D. malayanus* is synonymous with Gilbert's species. Apart from a supposed difference in the form of the antorbital organs, probably due to the manner of preservation, the only difference in the two descriptions which I am able to detect concerns the position of the PLO photophore, which is said to be much nearer to the pectoral fin than to the lateral line in *D. malayanus,* and rather nearer to the latter in *D. garmani.* The types of *D. malayanus* are 14 to 36 mm. in length.

Diaphus perspicillatus (Ogilby, 1898).

Æthoprora perspicillata, Ogilby, Proc. Linn. Soc. N.S.Wales, xxiii. 1898, p. 36; Waite, Rec. Austral. Mus. v. 1904, p. 149, pl. xviii. fig. 1.

Myctophum (*Nyctophus*) *elucens,* Brauer, Zool. Anz. xxviii. 1904, p. 401.

Myctophum (*Diaphus*) *elucens,* Brauer, 'Valdivia' Tiefsee-Fische, p. 219, fig. 140 (1906).

Diaphus gigas, Gilbert, Mem. Carnegie Mus. vi. 1913, p. 93, pl. xii. fig. 2.

Hab. N.E. coast of Africa; Lord Howe Island; Japan.

I have examined three specimens of *D. perspicillatus* from the type-locality, and regard these as identical with *D. elucens.* The diameter of the eye is 2¾ to 3 in length of head. *D. perspicillatus* cannot be identical with *D. effulgens* (Goode & Bean) as suggested by Parr *, for in that species the upper SAO and Pol photophores are distinctly below the lateral line, and there are differences in the number and arrangement of the other photophores. *D. gigas* from Japan is almost certainly this species, but *D. chrysorhynchus,* Gilbert & Cramer, from the Hawaiian Islands, appears to be distinct.

MYCTOPHUM, Rafinesque, 1810.

Myctophum pterotum (Alcock, 1890). (Fig. 2.)

? *Scopelus brachygnathos,* Bleeker, Act. Soc. Sci. Indo-Neerl. i. 1856, Menado, p. 65

Scopelus (*Myctophum*) *pterotus,* Alcock, Ann. & Mag. Nat. Hist. (6) vi. 1890, p. 217; Illust. Zool. 'Investigator,' Fishes, pl. ix. fig. 3 (1894).

? *Scopelus* (*Myctophum*) *pyrsobolus,* Alcock, *t. c.* p. 218, pl. viii. fig. 3; Illust. Zool. 'Investigator,' Fishes, pl. xxx. fig. 3 (1900).

Scopelus pterotus, Alcock, Cat. Indian Deep-Sea Fish. p. 162 (1899).

? *Scopelus pyrsobolus,* Alcock, *t. c.* p. 163 (1899).

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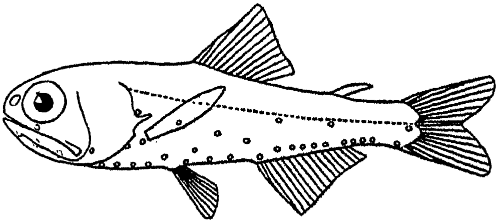
* *T. c.* pp. 120, 139.

Myctophum pterotum (part.), Brauer, 'Valdivia' Tiefsee-Fische, p. 182, fig. 94 (1906).
Myctophum gilberti, Evermann & Seale, Bull. Bur. Fish. xxvi. 1907, p. 55, fig. 1.
Myctophum pterotum, Gilbert, Mem. Carnegie Mus. vi. 1913, p. 81; Weber, Fische 'Siboga'-Exped. pp. 86, 669 (1913); Weber & Beaufort, Fish. Indo-Austral. Arch. ii. 1913, p. 157; Barnard, Ann. S. Afr. Mus. xxi. 1925, p. 242; Parr, Bull. Bingham Ocean. Coll. iii. (3) 1928, p. 60.

Depth of body 3½ to 4 in the length, length of head about 3. Snout much less than diameter of eye, which is a little greater than interorbital width and 2¾ to 3 in length of head. Maxillary not greatly expanded behind, extending well beyond posterior margin of eye. Dorsal 12–13; origin well behind root of pelvic. Anal 17–18; origin below posterior part of dorsal. Pectoral 13–15; nearly as long as head. Pelvic 8. Probably about 30 scales in the lateral line. PLO photophore rather nearer to pectoral fin than to lateral line. 2 PVO, the second on lower part of pectoral base. 5 PO, the fifth elevated and just above root of pelvic. 4 VO, the second elevated. VLO much nearer to lateral line than to pelvic fin. 3 SAO, forming a very obtuse angle, the third near the lateral line. PLO, VLO, SAO_1, SAO_2, and AO_2 forming a nearly straight line. 6+4 AO, the first nearer anal base than remainder. 1 Pol, close to lateral line. 2 Prc, widely separated, the upper just below lateral line.

Fig. 2.



Myctophum pterotum (Alcock, 1890). × 1½.

Hab. Indian and Pacific Oceans.

Described from eight specimens, 31 to 45 mm. in length, including some of the types of the species.

Myctophum glaciale (Reinhardt, 1837).

I have examined the types of *Scopelus scoticus*, Günther (Pelagic Fish. 'Challenger,' 1889, p. 31). These are very young, but are almost certainly identical with *M. glaciale.*

Myctophum nigro-ocellatum (Günther, 1873).

Some of the specimens recorded by Günther as *M. coccoi* prove to belong to this species. They are from Zanzibar (Playfair Coll.), north of Admiralty Island ('Challenger'), and Volcano Island ('Challenger'). *Scopelus indicus,* Day (Fish. India, 1877, p. 507, pl. cxviii. fig. 2), the type of which I have examined, proves to be this species.

Myctophum spinosum (Steindachner, 1867).

Three specimens from Zanzibar (Playfair Coll.), recorded by Günther as *M. asperum*, belong to this species.

Myctophum evermanni, Gilbert, 1905.

A single specimen from between Admiralty Island and Papua ('Challenger'), recorded by Günther as *M. caninianum.*

Myctophum affine (Lütken, 1892).

Specimens from Zanzibar (Playfair Coll.), north of Admiralty Island ('Challenger'), and from between Admiralty Island and Papua ('Challenger'), recorded by Günther as *Myctophum coccoi* and *M. caninianum.*

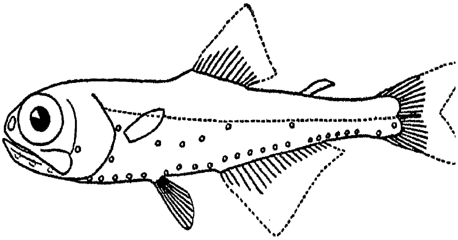
Myctophum parvimanum (Günther, 1864). (Fig. 3.)

Scopelus parvimanus, Günther, Cat. Fish. v. 1864, p. 406.

Depth of body 4½ in the length, length of head 3⅗. Snout much shorter than diameter of eye, which is nearly twice the interorbital width and 2¼ in length of head. Maxillary expanded behind, extending a little beyond posterior margin of eye. Dorsal 13; origin about equidistant from tip of snout and base of caudal, well behind root of pelvic. Anal 19; origin below middle of dorsal. Pelvic 8. Scales cycloid, about 35 in the lateral line. PLO photophore above level of upper part of pectoral base. Apparently only one PVO, 5 PO, all level. 4 VO, the second a little elevated. VLO about equidistant from pelvic fin and lateral line. 3 SAO, almost forming a straight line, the first nearly above second VO and a little below level of VLO. 6+6 AO, all level; four or five posteroanals behind base of anal. 1 Pol, in contact with lateral line. 2 Prc, widely separated, the upper nearer to the lateral line than to lower edge of caudal peduncle.

Hab. New Zealand.

Fig. 3.



Myctophum parvimanum (Günther, 1864). × 1.

Described from the type of the species, 62 mm. in length.

This species appears to belong to the group of species of Parr's revision which includes *M. aurolaternatum*, *affine*, *punctatum*, and *phengodes*.

LVIII.—*Description d'espèces nouvelles de* Coccinellidæ.
Par le Dr. A. SICARD.

PARMI les Coccinellidæ soumis à mon examen par M. le Dr. G. A. K. Marshall, les espèces suivantes m'ont paru nouvelles :—

Synharmonia fijiensis, sp. n.

En ovale court, un peu acuminée en arrière, glabre, luisante, à ponctuation assez dense et bien marquée, mais superficielle, simple sur la tête, le corselet et le disque des élytres, entremêlée de quelques gros points seulement sur le repli élytral.

Tête d'un blanc-roussâtre, avec les antennes et les palpes de même couleur, plus finement ponctuée que le corselet. Ce dernier sinueusement échancré à sa partie antérieure, avec tous les angles arrondis, les côtés légèrement convergents, la base à peine sinuée au devant de l'écusson, d'un blanc jaunâtre, avec, sur le milieu, une tache longitudinale noire, irrégulièrement rétrécie dans sa partie médiane, couvrant un peu moins de la moitié de la largeur médiane à la base et s'étendant en avant sur l'espace interoculaire; ponctuation assez dense et superficielle, un peu plus fine que celle des élytres. Ecusson en triangle équilatéral, noir, finement ponctué.

Elytres plus larges que le corselet à la base, arrondis aux épaules, atténués de là jusqu'à l'extrémité; d'un jaune-rougeâtre, à dessin noir composé: 1°, d'une bordure suturale de la largeur de l'écusson à la base, brusquement dilatée au tiers de la longueur pour former une courte bande transversale (prolongée sur le tiers interne de la largeur de chaque élytre) retrécie ensuite, puis dilatée de nouveau un peu après la moitié de la longueur pour former une tache en forme de losange dont l'extrémité postérieure se prolonge en s'atténuant jusqu'à l'angle apical; 2°, de trois taches noires, la première semicirculaire à la base, en face du calus huméral dont son extrémité postérieure atteint le sommet, la seconde et la troisième situées respectivement en face de la première et de la seconde dilatation de la bordure suturale dont elles restent un peu plus éloignées que du bord externe, toutes deux de forme irrégulière.

Dessous d'un noir luisant sur la poitrine et le milieu des deux premiers arceaux de l'abdomen, le reste du ventre étant roux ainsi que les pieds; prosternum un peu plus clair à sa partie antérieure. Epimères du mésosternum d'un blanc-jaunâtre, celles du métasternum marquées d'un trait blanc. Prosternum muni de deux fines carènes n'atteignant pas la base, marquées seulement au niveau des hanches antérieures. Plaques abdominales en triangle curviligne, convexes en dedans à leur partie interne, concaves à leur partie externe, leur sommet atteignant en arrière le bord postérieur du premier segment abdominal.

Longueur 0·0045–0·005 mm.

Iles Fidji: Suva, vii. 1927 (*H. W. Simmonds*).

Dans un exemplaire communiqué par M. Marshall les deux taches latérales sont unies entr'elles à leur partie interne par un trait noir.

Cleis labyrinthica, sp. n.

En ovale court, peu convexe, brillante en dessus ; ponctuation extrêmement fine, visible seulement à un fort grossissement, écartée, superficielle, légèrement inégale ; d'un blanc flavescent à dessin brun (rappelant celui de certaines *Psyllobora*) ne laissant paraître de la couleur foncière qu'un réseau à lignes étroites. Tête d'un blanc d'ivoire marquée sur le front de deux rangées parallèles longitudinales de trois ou quatre points bruns, les deux postérieurs, plus gros, plus foncés, placés sur le vertex. Labre, palpes et antennes roux, ces dernières dépassant en longueur la moitié des côtés du prothorax, à dernier article aplati, largement arrondi à l'extrémité.

Corselet assez fortement sinué en devant, ses côtés en gouttière étroite, relevée, transparente ; angles antérieurs avancés, émoussés à leur extrémité, les postérieures très largement arrondis ; d'un blanc d'ivoire, marqué de sept taches brunes (quatre antérieures et trois basales), la rangée antérieure formée de deux points externes arrondis, également éloignés des côtés et des bords antérieurs du prothorax et de deux points internes en forme de virgules convergentes en arrière de chaque côté de la ligne médiane ; des trois points de la base, les deux externes sont triangulaires, à sommet antérieure, en face du calus, couvrant à peu près le quart externe de la base, l'interne arrondi, antéscutellaire, ne touchant pas tout à fait la base du prothorax. Ecusson petit, brun, en triangle transverse. Elytres plus larges que le prothorax à la base arrondis aux épaules, ovales, à courbe externe peu accusée, rebord transparent, légèrement relevé en gouttière étroite prolongée jusqu'à l'extrémité ; d'un blanc d'ivoire à dessin brun, composé : 1°, d'une bordure suturale un peu plus large que l'écusson à la base, d'abord parallèle, puis brusquement dilatée après la moitié de la longueur en forme de courte bande transversale arrondie à sa partie externe, couvrant le tiers interne de la largeur de l'elytre ; la bordure retrécie à nouveau jusqu'à l'extrémité où elle se prolonge un peu le long du bord postérieur de l'élytre ; 2°, d'une tache arrondie couvrant un peu moins de la moitié interne de l'élytre, également éloignée de la base et de la suture, en arrière de l'écusson ; 3°, d'un dessin onduleux semblant composé d'une tache triangulaire juxtasuturale située en arrière de la tache dont elle épouse le contour postérieur, prolongée en dehors par un trait oblique dirigé sur le calus, et là revenant brusquement en arrière en forme de bordure juxtalatérale prolongée en s'elargissant jusqu'au tiers de la longueur; 4°, d'une tache petite, ovale située juste en face de la dilatation de la bordure suturale, sur le prolongement de la bordure latérale formée par la partie externe du dessin précédent, ne touchant pas le bord externe de l'élytre ; 5°, d'une tache discale en forme de clou à tête antérieure et prolongée du quart aux quatre cinquièmes de la longueur ; 6°, d'une tache préapicale en forme de V dont les branches embrassent l'extrémité effilée de la tache claviforme, ce dessin ne laissant subsister de la couleur foncière que des lignes blanches étroites formant un réseau compliqué. Prosternum blanc, avec la partie située en dehors des hanches antérieures d'un roux vif. Mésosternum blanc; métasternum roux taché de blanc antérieurement et avec les épimères blanches. Abdomen roux avec le prolongement intercoxal blanc. Pieds et hanches d'un roux vif. Plaques abdominales en arc de cercle un peu acuminé en arrière, atteignant ou à peu près le bord postérieur de l'arceau.

Longueur 0·0045 mm.

Cette espèce a tout à fait la forme et le dessin du *Cleis lynx*, Muls., mais elle est un peu plus grande et son dessin est différent. Je n'en ai vu que deux exemplaires en très mauvais état et incomplets, venant d'Haïti, 10. v. 1927 (*G. N. Wolcott*).

Endochilus meridionalis, sp. n.

Arrondi, convexe, luisant, d'un rouge clair en dessus et en dessous avec la tête, le corselet et une étroite bordure externe aux élytres (s'atténuant en arrière) noirs. Pieds d'un brun de poix. Disque des élytres glabre. Tête, corselet et périphérie des élytres à pubescence grisâtre assez longue et dense. Dessous du corps à pubescence très fine et peu visible.

Long. 0·0025 mm.

Le genre *Endochilus* semblait jusqu'ici confiné dans la région N.O. de l'Afrique équatoriale (Cameroun, Congo) et les îles voisines (S. Thomé, I. Principe). C'est la première espèce du genre rencontrée au dessous de l'équateur, elle se distingue de toutes les autres par sa petite taille (l'*E. minor*, Wse., a 0·0038 mm. de longueur). Elle diffère de l'*E. minor*, Weise, par l'étroitesse de la bordure noire des élytres, par la couleur franchement noire du corselet qui est en outre entièrement pubescent au lieu d'être glabre sur le disque.

Tanganyika : Bukoba, 27. ix. 26 (*A. H. Ritchie*).

Cryptognatha simillima, sp. n.

Cr. gémellatæ affinis, margine suturali elongata, angustata, haud maculiformi, distincta.

Arrondie, convexe, glabre, luisante, à ponctuation très nette et assez dense. Très voisin de la *Cr. gemellata*, Muls., dont elle n'est peut-être qu'une variété. Elle s'en distingue par le dessin de son corselet marqué, outre les cinq taches situées comme dans *C. gemellata*, d'une tache externe à la base de chaque côté, soit sept taches au lieu de cinq, et par le dessin des élytres ; celui-ci est composé des mêmes taches que chez *gemellata*, mais les deux premières taches restent distinctes, non convergentes en arrière, la troisième est plus grosse, non transversale, nettement triangulaire, enfin la tache suturale est en forme de bordure, non ou indistinctement élargie en avant, tandis que chez *gemellata* elle forme une grosse tache ronde prolongée en arrière en forme de bande atténuée.

Antilles : La Trinité (*T. H. C. Taylor*).

La *Cr. gemellata*, Muls., dont je possède des types est indiquée avec doute du Mexique, mais elle semble ne pas être très rare à Cayenne. Elle présent d'assez nombreuses variétés à taches plus ou moins confluentes, mais chez toutes la tache suturale est maculiforme en avant.

Scymnus (Pullus) salomonis, sp. n.

En ovale court, très convexe, couvert d'une pubescence d'un gris-jaunâtre assez dense, à ponctuation fine et régulière. Tête d'un roux-rougeâtre avec les palpes et les antennes de couleur un peu plus claire. Corselet à côtés arrondis, convergents antérieurement, à peine sinué à son bord antérieur, fortement sinué à sa base au devant de l'écusson ; roux avec une tache noire couvrant la moitié médiaire de la base et les deux tiers de la longueur, nettement limitée.

Ecusson triangulaire, noir.

Elytres de la largeur du corselet à la base, un peu élargis aux épaules, puis arrondis jusqu'à l'extrémité, à calus huméral saillant ; noirs avec l'extrémité d'un roux-rougeâtre, cette couleur couvrant à peu près le cinquième postérieur à la suture, limitée en avant sur chaque élytre par une ligne en arc de cercle convexe en avant. Dessous roux avec le méso- et le métasternum noirs, ainsi que le milieu du premier arceau ventral. Pieds entièrement roux. Plaques abdominales en arc de cercle complet, atteignant le bord postérieur de l'arceau, leur partie externe se terminant vers le tiers externe du bord antérieur du segment, en dedans des épimères. Prosternum avec deux lignes cariniformes peu élevées, convergentes en avant en forme de Λ aigu.

Longueur 0·002 mm.

Iles Salomon, 28. viii. 1928 (*R. W. Paine*).

Cette espèce ressemble comme coloration au *Sc. analis*, mais elle est bien plus petite. Sa forme et sa taille sont celles du *Sc. apiciflavus*, Mots., mais chez ce dernier le corselet est d'une couleur claire uniforme, sans tache foncée à la base.

Scymnus (*Clitostethus*) *fumatus*, sp. n.

En ovale court, médiocrement convexe, luisant, à pubescence blanchâtre courte, ne masquant pas la couleur foncière; d'un blanc d'ivoire avec la poitrine un peu rembrunie et les élytres d'un brun fuligineux.

Tête assez grosse, front étroit, moindre que le plus grand diamètre d'un œil; yeux gros; labre allongé, jaunâtre, antennes et palpes flaves. Corselet d'un blanc-jaunâtre, à angles antérieurs aigus, les postérieurs obtusément arrondis, sinué à la base. Ecusson blanc.

Elytre de la largeur du corselet à la base, à calus huméral gros, saillant, oblong, d'un brun-fuligineux sur toute leur surface, à ponctuation extrêmement fine et superficielle. Prosternum blanc, très court, aplati. Mésosternum très court, en forme de bande transversale; métasternum très grand, rembruni ainsi que le mésosternum, y compris les épimères. Abdomen d'un blanc-roussâtre. Plaques abdominales en arc de cercle aplati restant éloignées du bord postérieur du segment dont elles couvrent les deux tiers antérieurs. Pieds blancs.

Longueur 0·0015 mm.

Ceylan: Peradeniya, 27. x. 1928 (*J. C. Hutson*).

Ressemble à l'espèce suivante, dont il diffère par sa forme plus élargie en arrière, moins acuminée, ses plaques abdominales complètes, moins rapprochées du bord postérieur du segment et par son corselet concolore dans les deux sexes.

Scymnus (*Clitostethus*) *dispar*, sp. n.

Corps en ovale court, obtus en avant, atténué et un peu acuminé en arrière, médiocrement et régulièrement convexe, couvert d'une pubescence grisâtre courte qui ne masque pas la couleur foncière, à ponctuation fine et serrée; d'un blanc d'ivoire sur la tête et le corselet (ce dernier marqué sur le tiers médian d'une bande longitudinale brune chez la ♀), d'un brun uniforme, plus ou moins foncé sur les élytres. Corselet de la largeur des élytres à la base, à côtés fortement convergents en avant. Tête inclinée avec le labre allongé. Palpes et antennes d'un blanc-roussâtre. Dessous d'un blanc légèrement jaunâtre, plus clair sur les bords et l'extrémité de l'abdomen. Prosternum très court, incliné, caché entre la tête et le mésosternum, ce dernier coupé droit à son bord antérieur sur lequel vient s'appuyer le labre qui est grand et allongé. Ligne fémorale grande, atteignant presque le bord de l'arceau, horizontale en arrière, terminée à sa partie externe par un petit crochet dirigé brusquement en avant mais n'atteignant ni le bord antérieur ni le bord latéral de l'arceau, la plaque ainsi circonscrite est presque rectangulaire, transversale, à ponctuation plus fine que le reste du segment.

Pieds d'un blanc d'ivoire.

Longueur 0·0017 mm.

Guyane anglaise: Georgetown, v. 1926 (*L. D. Cleave, Jr.*).

Ressemble à peu près comme coloris à un *Scymnus* (*Clitostethus*) *arcuatus*, R., dépourvu de dessin élytral clair, mais il est plus allongé.

Scymnus (*Nephus*) *æneipennis*, sp. n.

Subrotundatus, convexus, pube tenui grisea vestitus. Capite, prothorace abdomineque rufis, meso- et metasterno nigricantibus. Elytris viridescentibus.

Arrondi, convexe, couvert d'une légère pubescence grise. Tête et corselet roux, ce dernier parfois rembruni à la base, la première un peu plus pâle, finement ponctuée avec les antennes et les palpes roux, le second à côtés faiblement arrondis, luisant, à ponctuation fine et clairsemée. Élytres un peu plus larges que le corselet à la base, à calus huméral distinct, régulièrement arrondis jusqu'à l'extrémité, à ponctuation fine mais bien marquée et assez dense, d'un vert-bronzé métallique brillant. Prosternum large, triangulaire, plan, sans carènes, roux. Méso- et métasternum noirâtres. Ventre roux. Ligne abdominale courte, en arc de cercle un peu sinué, très rapprochée par sa partie postérieure du bord postérieur du premier segment abdominal, mais sans se confondre avec lui.

Pieds roux.

Longueur 0·0017 mm.

Antilles: La Trinité (*T. H. C. Taylor*).

Scymnus (*Nephus*) *castaneicolor*, sp. n.

En ovale oblong et régulier, couvert d'une pubescence d'un gris-jaunâtre courte et pruineuse, peu fournie ; ponctuation simple, plus fine sur le corselet, luisant, d'un brun chatain en dessus avec la tête (♂?) et une tache sur chaque élytre d'un jaune testacé ; la tache étendue de la moitié aux trois quarts de la longueur, grosse, touchant presque la suture et le bord latéral, arrondie et obliquement coupée en avant de dedans en dehors et d'avant en arrière.

Dessous d'un brun chatain un peu plus clair sur l'abdomen. Prosternum sans carènes, régulièrement convexe. Ligne fémorale atteignant les quatre cinquièmes du premier segment ventral, arquée à sa partie interne, se dirigeant ensuite presque parallèlement au bord postérieur du segment vers le bord externe qu'elle n'atteint pas. Antennes, palpes et pieds d'un testacé roussâtre.

Longueur 0·0015–0·0017 mm.

Morogoro : Tanganyika, 8. xii. 1926 (*A. H. Ritchie*).

Distinct du *Sc.* (*Sidis*) *binœvatus*, Muls., outre les caractères génériques, par sa forme plus oblongue, sa taille moitié plus petite, sa couleur brune, ses pieds, y compris les cuisses, entièrement d'un testacé roussâtre.

Scymnus (*Nephus*) *njalensis*, sp. n.

Oblong, convexe, luisant, finement pointillé, à pubescence grise courte et assez peu dense. Tête d'un jaune-flave avec les palpes et les antennes d'un jaune-blanchâtre, très finement pubescente de gris-jaunâtre, avec le labre très court et les yeux médiocres ; front à bords presque parallèles. Corselet d'un jaune-blanchâtre avec une tache brune mal délimitée couvrant la moitié de la base et avancée en se rétrécissant un peu jusqu'à la sinuosité postoculaire, sinué à la base au devant de l'écusson, à côtés convergents, presque droits. Ecusson brun clair, triangulaire.

Elytres un peu plus fortement ponctués que le corselet, à calus huméral petit, mais bien accusé, arrondis sur les côtés, d'un brun chatain passant au jaunâtre sur le cinquième postérieur environ.

Prosternum en carré long, non caréné, brunâtre au milieu, avec les côtés passant au jaunâtre clair. Méso- et métasternum brun, ce dernier fortement ponctué. Plaques abdominales en arc de cercle, couvrant les cinq sixièmes du premier arceau ventral, à ponctuation cicatricielle, ainsi que la partie avoisinante du segment abdominal.

Abdomen d'un jaune-brunâtre pâle. Pieds flavescents.

Long. 0·0015–0·002 mm.

Sierra Leone : Njala, 30. viii. 1924 (*E. Hargreaves*).

Chez quelques exemplaires, la partie jaunâtre postérieure des élytres est nettement separée de la couleur brunâtre du fond et offre une tache en forme de croissant à concavité antérieure.

Scymnus (*Nephus*) *ornatus*, Sic.

Je rapporte à cette espèce décrite de Kaedi (Mauritanie) deux exemplaires de Sierra Leone, de taille un peu plus grande. Chez l'un qui est légèrement immature les deux taches transversales de chaque élytre sont réunies entr'elles et les deux internes de chaque rangée sont de plus réunies longitudinalement, formant ainsi sur l'élytre droit le dessin de la lettre C chez le second, la tache externe de la première rangée a disparu et les deux taches postérieures sont unies transversalement.

Sierra Leone : Njala, vii. 1928 (*E. Hargreaves*).

Sticholotes sublævis, sp. n.

Hémisphérique, très convexe, luisante, d'un noir profond en dessus et en dessous avec les élytres tachés de jaune clair et l'extrémité de l'abdomen roussâtre. Ponctuation extrêmement fine sur la tête et le corselet, presqu'imperceptible sur les élytres, plus nette en dessous. Labre, antennes et palpes bruns ainsi que les tarses, fémurs noirâtres, tibias brun foncé.

Cette espéce est remarquable dans ce genre par sa ponctuation extrêmement fine, visible seulement à un fort grossissement, sans mélange de points plus gros. Sur la tête, qui est grosse avec des yeux saillants, la ponctuation est plus nette que sur le corselet et plus visible chez ce dernier que sur les élytres, surtout sur le bord antéro-externe.

Le corselet est entièrement noir, à angles postérieurs obtus, avec la base en arc de cercle très convexe. Les élytres sont de la largeur du corselet à la base, très arrondis, convexes, à tranche horizontale étroite prolongée jusqu'à l'apex en s'atténuant légèrement ; ponctuation indistincte sauf le long du bord latéral ; noirs avec deux courtes bandes jaunes : la première naissant près de la base qu'elle ne touche pas, au niveau de l'extrémité de l'écusson dirigée en dehors et en arrière jusqu'au tiers de la largeur et au quart de la longueur de l'élytre, puis obliquant transversalement en dehors vers le bord latéral qu'elle n'atteint pas, cette partie transversale restant aussi éloignée de la suture que du bord externe ; la

deuxième bande située aux deux tiers de la longueur, un peu oblique en arrière et en dehors, plus éloignée du bord externe que de la suture. Epipleures larges, ponctuées, concaves, à pubescence grisâtre. Plaques abdominales en arc de cercle régulier, atteignant le bord postérieur du segment.

Long. 0·0028 mm.

Pahang (Malacca), Cameron's Highlands, 21. v. 1923 (*H. M. Pendlebury*).

LIX.—*On Wolf-Spiders' Memories.*

By Theodore H. Savory, M.A.

It is well known that female wolf-spiders carry their egg-cocoons attached to their spinnerets and that they show an apparent affection for these burdens, strenuously resisting attempts to take them away. Dr. and Mrs. Peckham's experiments on this feature of the spider's life have often been quoted: their results showed that the spider generally retained the memory of her cocoon and would re-accept it after an interval of twenty-four hours, but would not do so after forty-eight hours. Fabre showed that the bereaved spider would accept with apparently equal readiness such substitutes as the cocoons of other spiders, cork balls, or pellets of cotton-wool. Such are the familiar facts, and the somewhat colourless conclusion that spiders' memory is not very good does not, at first sight, seem to call for any comment.

Study of the general behaviour of spiders shows that most of their activities are reflexes or tropisms, and it does not therefore seem probable that any true associative memory can be responsible for their re-acceptance of their cocoons after various intervals. Maturity in spiders is responsible for diverse actions of the chain-instinct type, most probably instigated by hormones liberated from the genital glands within. Thus the mature male is impelled to commence courtship, and the female, even if virgin, performs the elaborate process of cocoon-making—in fact, a spider's essential actions seem to be governed more by its physical than by its mental condition.

It was with these considerations before me that the investigation about to be described was undertaken. Wolf-spiders of the species *Lycosa amentata*, *L. lugubris*, and *L. pullata* are extremely numerous in my kitchen-garden and elsewhere in my neighbourhood, and numbers of them carrying their cocoons were caught during the past two summers. Their cocoons were taken away from them and returned after noted periods, differing from one to fifty hours. As soon as it was clear whether the spider would or would not accept the cocoon again, she was killed and the cocoon opened. The state of development of the eggs was examined, and, finally, the spider was dissected, that the state of her ovaries might be determined.

Spiders, even the larger British species, are by no means easy to dissect, and after considerable experience the following method was adopted. The spider should be well fed before the experiment and have plenty of water to drink; it is killed with chloroform vapour and not by the usual method of drowning in alcohol. The abdomen is cut off and placed on the glass plate of a dissecting microscope, illuminated from below; it is opened by two lateral incisions and the ovaries are then easily distinguished from the silk-glands and intestinal cæca. In all, over three hundred spiders were examined in this way. The results, which were remarkably consistent, may be summarisd thus:—

(i.) *Cocoon accepted.*—A spider which accepted her cocoon was found to possess very small ovaries. Each appeared on dissection to consist of a row of ten or a dozen minute transparent spherical cells. This condition might persist up to forty hours after the removal of the cocoon.

(ii.) *Cocoon rejected.*—Conversely, spiders which refused to resume possession of their cocoons were found to possess better-developed ovaries. The spherical egg-cells were not more numerous, but they were always larger than in the previous case and a certain proportion of them appeared to be opaque instead of transparent. This condition might be found two hours after robbing the spider of her cocoon, but was practically invariable after forty-five hours or more.

(iii.) *Length of Memory.*—The interval of time for which any individual spider "remembers" her cocoon is inversely proportional to its age—that is to say, a new cocoon is remembered for longer than an old one, which is soon forgotten. Some of my spiders refused to resume their cocoons only two hours after they had been removed, and the Peckhams record a case of refusal after one hour. Had the spiders' actions been due to associative memory, the results should have been exactly the reverse of this, for the longer a spider had carried her cocoon the better she should have known it and the longer she should have remembered it.

The probable course of events may be described as follows. In normal circumstances the first cocoons appear about the middle of May and are carried by the spiders at their spinnerets for five weeks. The young then emerge and mount upon their mother's back, where they remain for about a week. Less than two weeks after they have dispersed—that is to say, before the middle of July—the second cocoon appears and hatches before the middle of August. This time-table is made up from observations of the earliest occurrence of each stage during the past few years in Malvern, and may not apply to other parts of Britain. There are two essential features about it. One is that the production of the second cocoon is a normal occurrence (and third cocoons are not unknown); and the other is that there is an alternation of times when the cocoon is hanging at the spinnerets and times when it is not. Observation of the spiders and their cages shows that when the cocoon is being carried no drag-lines are laid down behind the spiders as they run, but that when the cocoon is dropped or removed the drag-line reappears. My dissections showed that while the silk-glands are inert the ovaries develop slowly, and that when activity recommences they begin to develop much more rapidly. Thus one can understand how it is that when a cocoon has been carried for a long time a much smaller advance in ovarian development is necessary to reach a given condition than when a cocoon has been carried for a shorter time. The one produces a "bad memory," the other a "good memory."

The general conclusion seems to be clear—that the spider's action is not determined by any memories, but is dictated by the condition of its organs. In this the behaviour is quite comparable to other instinctive actions that are common to the condition of sexual maturity, and to assume anything like true associative memory is unjustifiable because it credits the spider with a mental state it never attains. It is, moreover, particularly pleasing to be able to translate the spider's actions in the lowest possible terms and to find the translation supported by investigation of the actual condition of the internal organs.

The hypothesis that a mature ovary is associated with neglect of a cocoon and that loss of the ova (by laying) is followed by the carrying instinct clearly suggests a possible confirmation by artificial means. If a spider before laying her eggs could have them removed by a surgical operation, she ought, upon recovery, to exhibit the instinctive cocoon-carrying desire. The experiment did not, from the outset, seem to have a great chance of success, and was tried only because of the significance that would attach to the result, if any *. However, in the few attempts that I made, no spider managed to survive the combined effects of the anæsthetic and the operation. This failure is described in the hope that some other zoologist, a more skilful dissecter than I and perhaps working on a larger spider than a British *Lycosa* under half-an-inch long, may be able to repeat the experiment with success.

A different experiment seemed to show, as far as a single observation can be trusted, that there is no association in the spider's "memory" of her cocoon. One of the spiders in my cages laid its cocoon in the middle of the day, and I chanced upon the event. When the business was almost done and the finishing touches were being added, I took away the cocoon. A quarter of an hour later I offered the spider a small pellet of blotting-paper, and although she had never carried her first cocoon she attached the blotting-paper substitute to her spinnerets without a moment's hesitation.

This leads to the consideration of the spider's acceptance of substitutes. It is well known that wolf-spiders deprived of their cocoons will accept in place of them other cocoons, pith or cork balls, small pellets of cotton wool or blotting-paper, or, as Locket first described from obvervation of a natural occurrence, small land-shells. Their behaviour after their cocoon has heen removed is different; a few seemed dazed and inert, some run away the faster, the majority appear to be quite unaffected. It is unjustifiable to say that the spider searches for her lost cocoon.

The blindness of the instinctive behaviour is well shown when the cocoon is transfixed from above and so made immovable. The spider at first tugs at it with silk threads and then with her jaws, then rests motionless upon it and declines to move. Death may, and often does, follow from the consequent lack of food and drink before the spider will move, but if another cocoon is dropped by her side the spider will pick it up and carry it off, forsaking her own.

It was of interest to enquire for how long the spider would carry a substitute cocoon or one which had been chloroformed sufficiently to kill the spiderlings within. The result of about thirty trials was illuminating. The dummy cocoon is carried for something under five weeks, and when the spider at last drops it the state of her ovaries is indistinguishable from that of the ovaries of a spider whose cocoon is just hatching and liberating its contents.

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* Bonnet has recently stated that abdominal wounds are invariably fatal.

However, there is another, less mechanistic, side to the question, in which the observations I have made are precisely the reverse of those of Fabre. The deprived spider will not pick up anything—for example, bits of earth and grit or pieces of broken glass are neglected. If she is presented with her cocoon and a number of substitutes she adopts the cocoon and rejects the substitutes, though Fabre states the opposite fact. Nor is the mere fact of carrying some object absolutely all that the spider requires. If into the cage of a spider carrying a cotton-wool or blotting-paper cocoon a real one is dropped, the spider generally makes the exchange, although she may not do so at once. Within an hour, one finds as a rule that the transference has taken place. However, if the dummy cocoon has been carried for more than the forty-eight hours, the spider does not make the exchange at all, unless, of course, the dummy is forcibly removed and the real cocoon given back.

The mechanistic position may be defended when it is realised that the feel of a real cocoon produces a stimulus which is in some way more potent than that produced by the dummy: its appeal to protoplasmic memory, intensified by countless generations free from irritating experiment, is stronger than that of cotton-wool. A very interesting observation may be described in conclusion, as it seems to show that there is some sort of faint associative memory for the object carried. A spider was robbed of her cocoon on 15 June, 1929, and given a small shell which she accepted in its place. On the 23rd the shell was taken away and the cocoon given back, but the shell was then replaced in the cage. Whenever the spider encountered the cocoon she embraced it, crawled upon it, and seemed attracted by it. She did not reject the cocoon in favour of the shell, but a very careful observation of her actions for two hours left no doubt in my mind that the particular stimulus provided by the shell was to a certain extent retained by the spider. After this time she paid no more attention to it, as though the memory had faded.

Taken as a whole, these observations support the mechanistic interpretations of a spider's behaviour. A faint awareness, however, accompanies the instinctive actions and may be responsible for a kind of memory lasting, not for forty-eight hours, but for something less than two.

Malvern,
16 September, 1929.

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LX.—*Two new Species of* Cooperia *[Nematoda] from Australian Cattle.* By H. A. BAYLIS, M.A., D.Sc.

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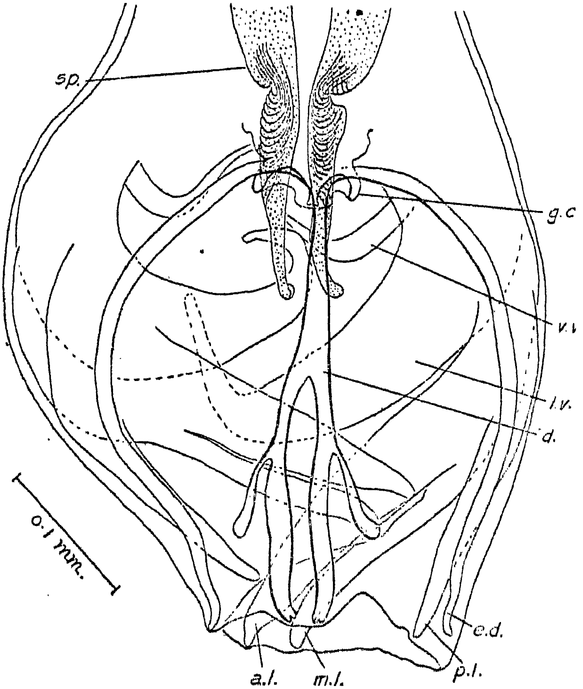
DURING a preliminary examination of a large collection of parasitic worms kindly entrusted to the writer for determination by Dr. G. M. Heydon, of the Australian Institute of Tropical Medicine, two species of the genus *Cooperia* were found which appear to be undescribed. These were contained in two bottles—one labelled "*Bos taurus* calf, intestine, Townsville, 29. 3. 15," and collected by Dr. W. Nicoll, the other labelled "Calves 3, 4, 5, intestine and cæcum, Townsville —. 7. 15," and collected by Mr. J. W. Fielding. In both bottles the two species occurred together.

Six species of *Cooperia* have already been recorded from domesticated ruminants. These are included in a useful key to the species of the genus recently given by Schwartz (1928). Neither of the present forms appears to be referable to any of these known species, though they both approach in some respects rather closely to one or other of them. Brief descriptions of the two species follow. Co-types will be deposited in the British Museum (Natural History) and in the Australian Institute of Tropical Medicine, Townsville, North Queensland.

Cooperia nicolli, sp. n. (Figs. 1–3.)

Cuticle longitudinally striated, ten of the striations being raised into prominent ridges showing a pectinated structure. In addition to these, four other (sublateral) less prominent ridges present. Cuticle of head usually inflated. Length, male 7·6–9 mm., female 11·6–12·6 mm. Maximum thickness of body in male (just in front of bursa) 0·18–0·24 mm.; in female (just in front of vulva, where there is a distinct fusiform swelling) 0·19–0·29 mm. Thickness in middle region of body, in both sexes, about 0·1–0·15 mm. Diameter of head (excluding cuticular expansion) 0·025–0·035 mm. Length of œsophagus, in male about 0·4 mm., in female 0·47–0·49 mm.

Fig. 1.



Cooperia nicolli, sp. n.

Bursa of male, dorsal view. *a.l.*, antero-lateral ray; *d.*, dorsal ray; *e.d.*, externo-dorsal ray; *g.c.*, genital cone; *l.v.*, latero-ventral ray; *m.l.*, medio-lateral ray; *p.l.*, postero-lateral ray; *sp.*, spicule; *v.v.*, ventro-ventral ray.

Male with long and relatively stout dorsal ray (fig. 1, *d.*), bifurcated at about the middle of its length, having the tips of its terminal branches slightly notched, and giving off, some distance behind the bifurcation, a pair of club-shaped lateral (or "ventral") branches. Latero-ventral ray (fig. 1, *l.v.*) stouter than antero-lateral, and stoutest of all the rays. Spicules (fig. 1, *sp.*, and fig. 2) similar to those of *C. pectinata*, Ransom, 1907, but measuring 0·35–0·39 mm. in length. A twisted flange, prominent on the ventral surface in the middle region of the spicules, and passing on to the dorsal surface distally, bears a number of transverse ridges.

Fig. 2.

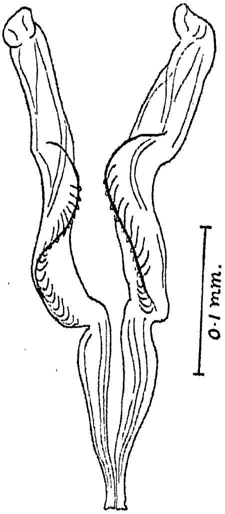
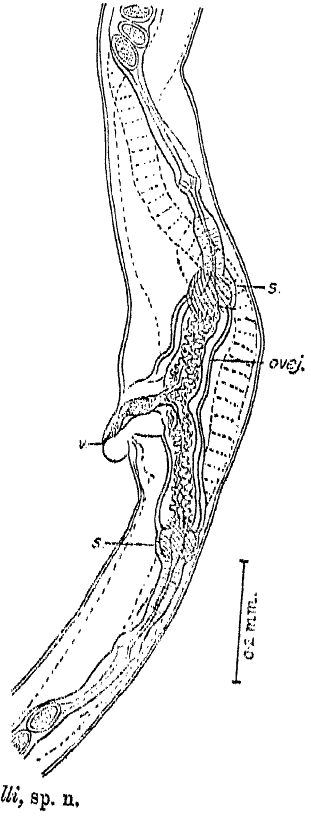


Fig. 3.



Cooperia nicolli, sp. n.

Fig. 2.—Spicules, ventral view.
Fig. 3.—Vulvar region of female, lateral view. *ovej.*, ovejector *s.*, *s.*, sphincters of ovejectors; *v.*, vulva.

Tail of female about 0·25 mm. long, with a pair of caudal papillæ at 0·1–0·12 mm. from the tip. Vulva (fig. 3, *v.*) a transverse slit with prominent cuticular lips, but not overhung by a flap; situated at 2·5–3 mm. from posterior end. Combined length of ovejectors, including sphincters, 0·48–0·6 mm. Eggs measure about 0·075 × 0·04 mm.

Fig. 4.

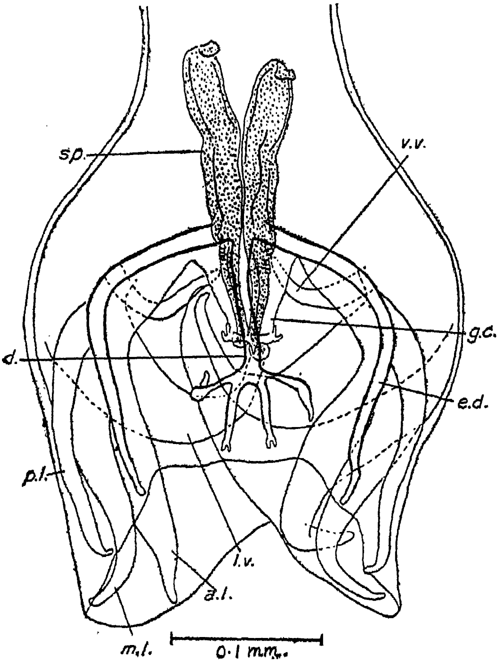
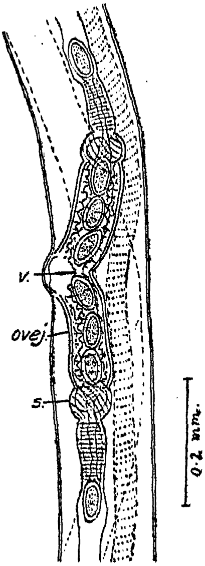


Fig. 5.



Cooperia fieldingi, sp. n.

Fig. 4.—Bursa of male, dorsal view. *a.l.*, antero-lateral ray; *d.*, dorsal ray; *e.d.*, externo-dorsal ray; *g.c.*, genital cone; *l.v.*, latero-ventral ray; *m.l.*, medio-lateral ray; *p.l.*, postero-lateral ray; *sp.*, spicule; *v.v.*, ventro-ventral ray.

Fig. 5.—Vulvar region of female, lateral view. *ovej.*, ovejector; *s.*, sphincter; *v.*, vulva.

Cooperia fieldingi, sp. n. (Figs. 4 & 5.)

Cuticle with longitudinal ridges as in *C. nicolli*, but with the two sublateral ridges on either side usually very inconspicuous. Cuticle of head usually inflated.

Length, male 6·7–9 mm., female 9·8–11·7 mm. Maximum thickness in male (just in front of bursa) 0·09–0·15 mm., in female (at vulva) 0·13–0·17 mm. Thickness in middle region of body, in both sexes, 0·07–0·13 mm. Diameter of head (excluding cuticular expansion) 0·025–0·03 mm. Length of œsophagus, in male about 0·4 mm., in female 0·4–0·44 mm.

Male with relatively short dorsal ray (fig. 4, *d.*), bifurcated at about its posterior third, having the tips of its terminal branches shortly bidigitate, and giving off a pair of lateral (or "ventral") branches at the level of the bifurcation. Latero-ventral and antero-lateral rays (fig. 4, *l.v.*, *a.l.*) of about the same thickness, and much stouter than the other rays. Spicules (fig. 4, *sp.*) rather similar in form to those of *C. curticei* (Railliet, 1893), but considerably larger, measuring 0·187–0·235 mm. in length.

Tail of female about 0·2 mm. long, with a pair of caudal papillæ at 0·08–0·085 mm. from the tip. Vulva a longitudinal slit with slightly swollen cuticular lips, situated at 2·2–2·4 mm. from posterior end. Vulvar region of body not swollen. Vagina very short. Combined length of ovejectors, including sphincters, 0·45–0·5 mm. Eggs measure about 0·075 × 0·04 mm.

In the males of both these species there is a prominent genital cone (figs. 1 & 4, *g.c.*), supported at its free end by a structure which appears to be of a chitinoid nature and produced on the dorsal side into a median and two lateral processes. The details of this structure are not easy to determine. Cram (1925) has described a similar and probably homologous, but more complex, structure in *Cooperia bisonis*. She refers to it as a "telamon." This term was originally used by Hall, who introduced it in 1921, for a supporting structure situated in the ventral and lateral walls of the cloaca, but has since been applied by various authors to structures which are probably not all homologous, being situated sometimes ventrally and sometimes dorsally to the spicules.

REFERENCES.

CRAM, ELOISE B. 1925. "*Cooperia bisonis*, a new Nematode from the Buffalo." Journ. Agric. Res., Washington, xxx. 6, pp. 571–573.

SCHWARTZ, B. 1928. "A new Species of Trichostrongylid Worm of the Genus *Cooperia* from the Carabao in the Philippine Islands, with a Review of the Genus." Proc. U.S. Nat. Mus. lxxiv. art. 20, pp. 1–5, pl. i.

LXI.—*Some new* Acrididæ (*Orthoptera*) *from Persia*.

By B. P. UVAROV and L. D. MORITZ.

PRELIMINARY descriptions of some of the following forms have been published by one of us [*], but since the descriptions were very brief and published in Russian it was thought advisable to present here their more extended re-discriptions.

The authorship of each species, or form, is indicated after the name.

The types will be presented to the Zoological Museum of the Russian Academy of Sciences, paratypes, when available, to the British Museum.

Eremippus persicus, Uvarov, sp. n.

♂ (*type*). Considerably larger than other known species of the genus.

Antennæ thick, nearly twice as long as head and pronotum together.

Head ascending. Face strongly oblique, forming an acute angle with the vertex. Frontal ridge deeply sulcate throughout. Fastigium of vertex nearly twice as long as broad, very acute apically. Foveolæ of vertex narrow, deep, almost wholly visible from above.

Pronotum constricted in the middle, saddle-shaped in profile. Median keel very distinct, acute, cut by the transverse sulcus slightly in front of the middle. Lateral keels not strongly developed, but distinct, converging towards the first sulcus, which is practically obsolete, diverging behind it, bent outwardly, and well-developed in the metazone, the disc of which is concave at the shoulders. Lateral pronotal lobes well ascendant in the anterior half.

Elytra extending well beyond the apex of the abdomen. Externo-median area dilated, with sparse oblique veinlets. Hind radial vein widely divergent from the second radial after the basal fourth, ending in the hind angle of the elytron. Discoidal area fairly broad, by far not reaching the middle of the elytron, with an irregular false vein.

Legs and sternum moderately pilose.

Coloration pale brownish grey, with some darker dots and streaks. Abdomen dirty stramineous.

♀ (*paratype*). Larger than the male. Head scarcely projecting above the pronotum. Face moderately oblique.

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[*] L. Moritz, 'A Study of Acrididæ in Northern Persia in 1927 and 1928.' [In Russian.] Askhabad, Station for Plant Protection, 1928. 52 pp., 13 figs.

Frontal ridge punctured, with obtuse margins, sulcate only below the ocellum. Fastigium of vertex a little longer than broad; its apical angle moderately acute. Pronotum as in the male, but the lateral keels are better pronounced, pale-coloured; transverse sulcus distinctly in front of the middle.

Length of body, ♂ (*type*) 15 mm., ♀ (*paratype*) 20; pronotum, ♂ 3, ♀ 4; elytra, ♂ 14, ♀ 20; hind femur, ♂ 8, ♀ 11.

Northern Persia: Serachs, prov. Khorasan, 3. vi. 1927, 1 ♂ (*type*); Western Persia, village Shahbag, prov. Irak-Adzhemi, 30. iv. 1904, 1 ♀ (N. Zarudnij leg.; Zoological Museum, Leningrad).

This insect has been reported by Moritz under the name *Stenohippus uvarovi*, but there was no description appended, and the name is not valid. A re-examination of the male by Uvarov showed the insect to belong to *Eremippus*, and in the materials from Persia belonging to the Russian Zoological Museum a female has been found which is believed to be conspecific with the male. Both the male and the female are in the last-named Museum.

Brunnerella mirabilis siazovi, Moritz.

1928. Moritz, *l. c.* p. 39.

Differs from the typical form only by the base of wings being pale yellow, instead of red.

Described from specimens taken at Turbet-i-Kheidari, prov. Khorasan, N. Persia.

Thalpomena persa, Sauss., ab. *violacea*, Moritz.

1928. Moritz, *l. c.* p. 41.

Differs from the typical *persa* by the somewhat more constricted pronotum, and by the basal portion of wings being pale violaceous, gradually turning blue near the anterior margin of the wing; the wing-band is faintly smoky, not sharply outlined, not reaching the hind margin.

Length of body, ♂ 17 mm., ♀ 21; elytra, ♂ 17, ♀ 20; hind femur, ♂ 9, ♀ 12.

Firusa in Kopet-Dagh mountains; Kheirabad and Meshed, prov. Khorasan, N. Persia.

Dirsh (Bol. R. Soc. Esp. Hist. Nat. 1927, p. 295) mentioned and briefly described this form without giving it a name. In the colour of wings it is intermediate between the typical pink-winged and the blue-winged ab. *cæruleipennis*, Uv. (Revue Russe d'Ent. xiv. 1914, p. 216).

Hyalorrhipis shestoperovi, Uvarov & Moritz, sp. n.

Intermediate in certain characters, particularly in the venation of elytra, between *H. clausi* (Ev.) and *H. turcmena*, Uv.

♂ (*type*). Antennæ considerably longer than head and pronotum together, slightly incrassate in the apical half.

Head strongly prominent above the level of pronotum. Face oblique. Frontal ridge practically parallel-sided throughout, slightly constricted below the ocellum; surface scarcely sulcate; margins slightly raised, obsolescent below the ocellum. Fastigium of vertex strongly sloping, margins feebly raised; surface feebly concave, not punctured. Foveolæ of vertex practically obsolete, not punctured. Eyes large, broadly oval, strongly prominent sideways and a little upwards; their distance on the vertex about half as broad as one of the eyes as seen from above.

Pronotum somewhat depressed from above and compressed laterally, selliform. Anterior margin rounded-prominent. Submarginal sulcus developed throughout, but less distinct on the disc. Three other sulci fine, but deep. Metazona considerably longer than prozona, with the shoulders somewhat raised; hind angle not broadly obtuse, rounded. Median keel obsolete in metazona, fine linear in metazona. Lateral lobes higher than long; their surface very uneven, the sulci being very deep; front lower angle a little more than right, rounded; lower margin feebly concave, slightly sinuate and strongly ascending; hind lower angle attenuate, acute, but with the tip rounded. Episternum elongate triangular, with the angles well rounded.

Elytra extending well beyond the apex of the abdomen, but relatively shorter than in the other two species mentioned above. Mediastinal field expanded in the basal half, beyond the middle hyaline with distant veinlets; false vein well developed. Radial veins practically straight in the basal half; second radial with one branch; third radial with three branches. Discoidal field with irregular veinlets, the cells in its apical part being 2–3 deep; discoidal vein strongly raised, practically straight, running very close to the third radial. Interulnar field slightly narrower than the discoidal, with an irregular false vein and a double row of irregular cells. Apical portion of the elytra with the veins not strongly developed; cells not very regular, mostly elongate.

Coloration brownish ochreous, with bluish-grey tint on the head and pronotum, and numerous rather large dark spots all over. Hind wings bluish. Hind tibia stramineous.

♀ (*paratype*). Considerably larger than the male. Antennæ relatively shorter; head less prominent above the pronotum.

Length of body, ♂ 12·5, ♀ 23 mm.; pronotum, ♂ 2·5, ♀ 4; hind femur, ♂ 7, ♀ 12; elytra, ♂ 13, ♀ 21.

N. Persia, between Kerki and Turbet-i-Kheidari, 24. vi. 1928, 1 ♂ (*type*); Turbet-i-Kheidari, 5. vii. 1928, 1 ♀, 7. vii. 1928, 1 ♂.

The species is named after Mr. Shestoperov, well-known naturalist who has done considerable amount of collecting in various parts of Central Asia.

Tmethis cinerascens bicoloripes, Moritz.

1928. Moritz, *l. c.* p. 44.

Differs from the typical subspecies (type-locality Shahrud in N. Persia) by the hind femora on the inside, and the hind tibia from the base to beyond the middle being purple; the apical portion of the tibiæ is blue.

Prov. Khorasan, Turbet-i-Kheidari, 11. vi. 1927; 2. vii. 1927; Serachs, 24. vii. 1927.

Tmethis moritzi, Uvarov, sp. n.

Allied to *T. ægyptiacus* Uv. (Bull. Min. Agr. Egypt, xli. 1924, p. 34), differing from it in smaller size, heavily spotted elytra, bluish wings, more convex and more attenuate behind metazona of the pronotum.

♂ (*type*). Antennæ considerably longer than head and pronotum together.

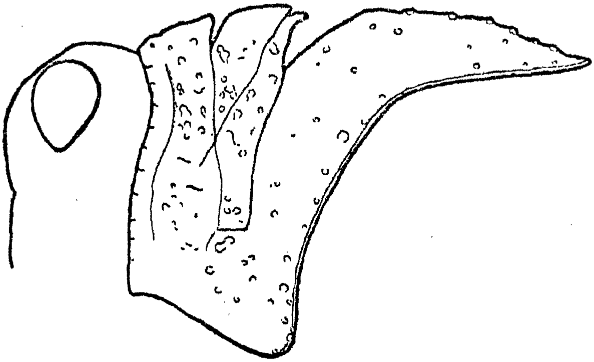
Face vertical, with few low callous tubercles. Frontal ridge narrow at the fastigium, with the margins straight and feebly divergent towards the ocellum, suddenly constricted under the latter, obsolescent further down; the surface shallowly sulcate; viewed in profile the ridge is feebly convex, shallowly excised below the ocellum. Fastigium of vertex sloping, rounded in profile; surface slightly concave, with fine transverse striation; margins not raised, very obtuse. Foveolæ of vertex practically obsolete.

Pronotum well compressed laterally, constricted in prozona, strongly gibbose. Anterior margin acutely produced forward. Median keel in the prozona narrowly tectiform, high, deeply divided into two portions, the hind one slightly divided again and recurved; sides of the prozona with conical tubercles. Metazona separated from the prozona by a very deep transverse sulcus, strongly gibbose, with distinct raised median keel; surface with a few small callous tubercles. Hind angle attenuate, acute, rounded apically, with the sides somewhat concave. Lower margin of lateral lobes oblique, practically straight, only near the front margin slightly concave.

Elytra reaching well beyond the middle of extended hind tibiæ. Wings elongate.

Hind femur moderately broad, rugulose and tuberculate on the outside. Upper carina somewhat expanded, with the upper margin slightly wavy, and bearing some small, irregular, obtuse teeth. Lower carina less expanded, the margin scarcely wavy.

Subgenital plate acutely conical.



Tmethis moritzi, Uv., sp. n., ♂ (type).

General coloration dirty greyish white, strongly marked with brown. Pronotum above pale chocolate-brown. Elytra with numerous chocolate-brown spots, partly confluent, but not forming definite fasciæ. Wings very pale greenish anteriorly, turning equally pale bluish behind; their band brownish black, complete, moderately broad, leaving a narrow margin behind; apical lobes only with some veins brownish, otherwise hyaline. Metanotum and first tergite partly bluish. Hind femur with two irregular brown fasciæ. Hind tibia light sulphur-yellow on the inside; the spines with narrow brown tips.

♀ (*paratype*). More heavily built than the male. Pronotum less constricted laterally and less gibbose above; its hind angle less acute, but still less than 90°. Wings mainly bluish; fascia paler.

Total length, ♂ 40, ♀ 48 mm.; pronotum, ♂ 11, ♀ 14; elytra, ♂ 37, ♀ 46; hind femur, ♂ 17, ♀ 20.

Persia: Kain, Khorasan province, 31. v. 1928, 1 ♂ (*type*), 1 ♀ (*L. D. Moritz*); Korasan province, 1 ♂, 1 ♀ (*Dzhalal Afshar*); Khushp (or Kuss), W. of Birdzhand, Khorasan province, 1 ♀; Shiraz to Bushire, Farsistan province, i. v. 1927, 1 ♂ (*M. Siazov*).

A very fine new species resembling somewhat a *Thrinchus* in the general shape and the type of coloration. The nearest known species is *T. ægyptius*, Uv., but the new species differs from it considerably by the characters stated above. It is not impossible, of course, that *T. ægyptius* and *T. moritzi* represent only two well-separated subspecies of one species, but this cannot be decided until the fauna of S.W. Asia is better known.

The male from Farsistan differs from the Khorasan specimens by its somewhat smaller size, more rough sculpture of the pronotum, and a narrow wing-fascia; if these characters will be found constant in all southern representatives of *T. moritzi*, it will be necessary to distinguish a southern subspecies.

LXII.—Marellia remipes, *gen. et sp. n.* (*Orthoptera*, Acrididæ), *a new Semiaquatic Grasshopper from S. America.* By B. P. Uvarov, Imperial Bureau of Entomology.

Marellia, gen. nov.

Similar in the general appearance and allied to the genus *Paulinia* (*Cœlopterna*, St.), but differing from it in a number of characters, the most striking one being the peculiar structure of the hind tibiæ.

♀. Antennæ short, filiform, slightly incrassate towards the apex. Head distinctly conical. Face strongly oblique; frontal ridge entirely obliterate below the ocellum, above it rather broad, strongly convex in the transverse direction. Fastigium of vertex well prominent in front of the eyes, its surface concave, with obtuse but well distinct margins.

Pronotum somewhat narrowed in front; upper surface practically flat; lateral keels obtuse, but distinct; median keel scarcely perceptible in the metazona only; lateral lobes forming an obtuse angle with the disc, with lower margin somewhat ascending in its anterior portion. Prosternum unarmed. Mesosternum large, obtusely projecting forward and partly covering the prosternum; mesosternal lobes transverse, trapezoidal, separated by an interspace which is a little broader than long. Metasternum large, its lobes separated from each other only by a very narrow linear interspace.

Elytra and wings normal.

Tarsi of the front and middle legs with a very small pulvillus between claws. Hind femur stout, rounded, gradually narrowed to the apex, but not constricted before the knee; knee-lobes each with an acute spine. Hind tibia considerably shorter than the femur, somewhat incurved; margins greatly expanded from about the middle; the spines remain only as indentations of the margins; tibial spurs and the first tarsal joint also expanded (the rest of the tarsi missing in the type).

Subgenital plate very large, trough-like, extended backwards, with the apex somewhat decurved and triangularly excised. Supra-anal plate elongate-oval, with a faint longitudinal sulcus and a bow-shaped transverse sulcus. Cerci simple. Upper valves of the ovipositor represented by a pair of feeble appendages, shallowly sulcate above and rounded apically; lower valves shorter than the upper ones, like small lamellæ strongly compressed laterally, not visible from above; the bottom of the trough of the subgenital plate has smooth grooves (the rest of the bottom being strongly pilose), apparently for the receipt of the valves.

Marellia remipes, sp. n.

Uniformly olive-green; disc of the pronotum, occiput, and upper surface of hind femora of a darker brown shade. Hind femora with blackish dots along the external carinæ. Hind tibiæ reddish in the expanded portion.

Face shiny, smooth generally, punctured slightly on the frontal ridge and more coarsely and densely on the cheeks. Head above rugulose; vertex pitted.

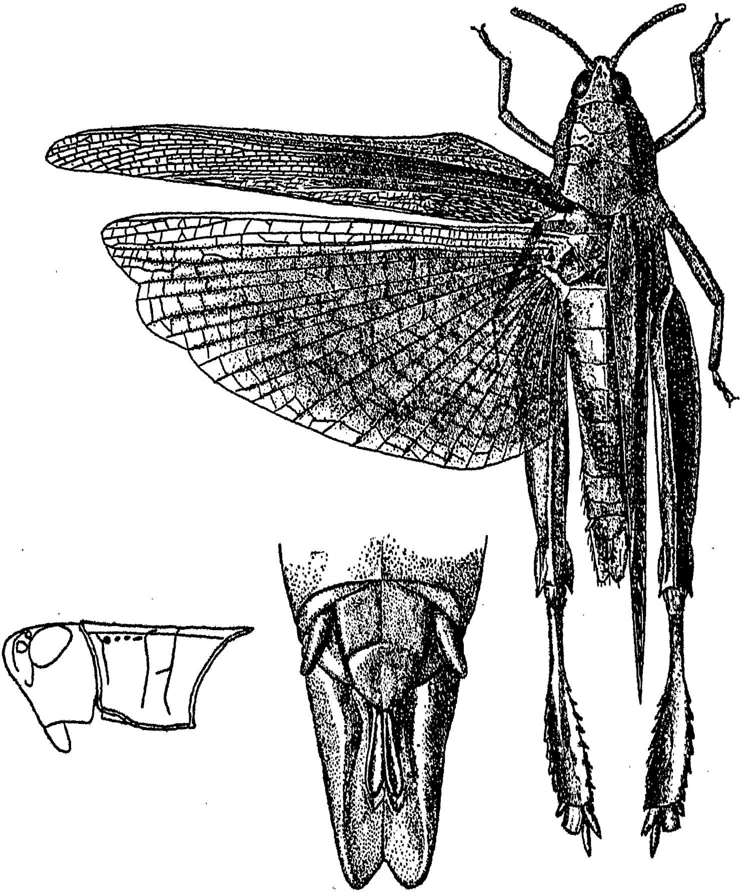
Pronotum strongly punctured, with several pairs of pits on the disc larger than the others (see figure). Anterior margin of the disc rounded-prominent, excised in the middle; posterior margin obtusely angulate, rounded. Lateral lobes trapezoidal, distinctly longer than high; anterior margin oblique, slightly concave; anterior angle obtuse, rounded; lower margin concave anteriorly, slightly convex in the rest; posterior angle right, not rounded; posterior margin concave.

Elytra narrowed apically, extending beyond the middle of the hind tibiæ.

Wings infumate, less so near the margin and the apex.

Length of body 27·5 mm.; pronotum 5·5; elytra 26; hind femur 16; hind tibia 11.

Described from a single female labelled "Paraná, *J. A. Rosas*," and submitted to the Imperial Bureau of Entomology by Professor C. A. Marelli, Director of the Zoological Gardens, La Plata. The type has been presented to the British Museum.



Marellia remipes, gen. et sp. n.

The highly aberrant group Paulinias comprised so far only one genus—*Paulinia*,—and the discovery of another genus of the group is in itself a very interesting one. It becomes still more interesting because of the obvious adaptations of the new insect to semiaquatic life, as presented by the remarkable expansion of hind tibiæ, such as is not known in any other Acridid. The structure of the terminal abdominal appendages is also highly peculiar in the new insect, though it must be mentioned that the same general type of their structure is observed in *Paulinia*, in which the external genitalia have never been properly described and figured. This structure seems to point to some very unusual habit of oviposition, but it would be useless to speculate as to what that habit may be. It is hardly necessary to add that any observations on the life and habits of the new insect, as well as on those of *Paulinia*, would be extremely interesting.

I have a great pleasure in dedicating this remarkable new genus to Prof. Carlos A. Marelli, who has done so much for the study of South American fauna.

LXIII.—*On some Orthoptera from South Japan.*

By G. BEY-BIENKO.

THE following contribution is based on a small but interesting collection of Orthoptera made by the brothers M. and S. Sapozhnikov during the months of May, June, and July of 1905, near the town Matzuyama on the isle of Sikok, which belongs to the southern group of the Japanese islands, and the town Matzuyama lies at a point 132° 50′ W. from Greenwich and 33° 52′ N.

The collection includes fifty-seven specimens belonging to twenty-six species, one of which is new to science.

The whole collection is deposited in the Zoological Museum of Tomsk State University, Siberia, where also the type of the new species is preserved.

For the opportunity to examine the collection I am very much obliged to Prof. H. Johansen, Director of the Museum; my cordial thanks are due to Mr. B. P. Uvarov of the Imperial Bureau of Entomology, London, for his advice on some doubtful points.

I am also thankful to Mr. V. N. Ermolaev of the Zoological Museum of the Tomsk State University for his kind assistance during my work in that Museum.

Blattidæ.

1. *Periplaneta americana* (L.).—2 ♂ ♂ and 2 ♀ ♀.

Widely distributed species, probably very common in Japan.

Mantidæ.

2. *Tenodera aridifolia* (Stoll).—2 ♂ ♂ and 2 ♀ ♀.

3. *Acromantis* sp.—1 specimen.

This specimen is badly preserved, but it is very probable that it does not belong to *A. japonica,* Westw., because it is of a smaller size and has more developed elytra; dimensions of this specimen are as follows:—length of body 23 mm., of pronotum 7, of elytra 19·5.

Tettigoniidæ.

4. *Ducetia japonica* (Thunb.).—1 ♀.

5. *Holochlora japonica,* Br.-W.—1 ♀.

6. *Euconocephalas gracilis* (Redt.).—1 ♂, 1 ♀.

This probably common Oriental species has not been recorded previously from Japan; its occurrence in that country is very interesting, because the nearest place from which this species is known is the Philippine Islands *. Both specimens are a little larger than the specimens described by Redtenbacher † and Hebard ‡.

7. *E. lineosus* (Walk.).—2 ♂ ♂ and 1 ♀.

This species was described by Redtenbacher under the name *Conocephalus fuscipes* §, which has been synonymised by Kirby ‖ with Walker's *C. lineosus.*

8. *Hexacentrus unicolor*, Serv.—1 ♀.

This specimen agrees well with the description given by Redtenbacher, excepting the length of elytra, which are somewhat shorter (only 26·5 mm.).

9. *Gampsocleis buergeri* (Haan).—2 ♂ ♂, 2 ♀ ♀, and 1 larva.

This species is very closely related to *G. sedakowii* (F.-W.), and probably represents only a subspecies of the latter, differing only in the shape of the male cerci and chiefly in the longer ovipositor.

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* Redtenbacher J., "Monographie der Conocephaliden."—Verh. zool.-bot. Ges. Wien, xli. 1891, p. 416.

† Redtenbacher, *loc. cit.* p. 415.

‡ Hebard, M., "Studies in Malayan, Melanesian and Australian Tettigoniidæ," Proc. Acad. Nat. Sci. Philad. lxxiv. 1922, p. 242.

§ Redtenbacher, *loc. cit.* pp. 421–422.

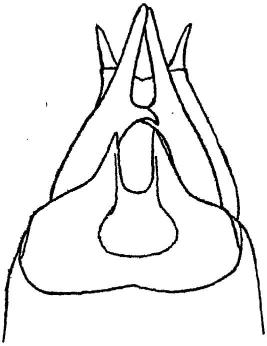
‖ Kirby, W., 'A Synonymic Catalogue of Orthoptera,' ii. 1906, p. 251.

10. *Metrioptera japonica* (Bol.)?—1 ♂. (Fig. 1.)

Bolivar's *Decticus japonicus*, described on the female sex only from Yezo *, certainly belongs to the genus *Metrioptera*, and is very probably identical with my specimen. As the male sex of this species is unknown, a brief description of my specimen may be of interest.

Large. Pronotum long, in the anterior part with a not deep but distinct longitudinal median furrow; hind part with a distinct longitudinal keel; lateral lobes almost vertical. Elytra reaching only to the apex of the abdomen, relatively narrow and regularly narrowing in the apical part; apex rounded-acute. Wings considerably shorter than elytra. Large abdominal tergite densely pilose, with a narrow triangular emargination and with long, straight, and sharp lobes. Cerci long, straight, extending strongly beyond the apex of the subgenital plate, with a thick basal half and slender, cylindrical, somewhat pointed at the apex, apical half; cercal tooth strong, somewhat incurved on the apex, placed at the middle of the cercus. Subgenital plate with a very feeble rounded emargination, with relatively long styli, which are practically as long as the lobes of the hind abdominal tergite; apex of the subgenital plate just below the tooth of the cerci. Hind femora long.

Fig. 1.



Metrioptera japonica (Bol.).
Dorsal view of apex of abdomen of ♂.

General coloration blackish brown. Head with a black broad supraocular fascia; maxillar palpi black, with the apex of the last joint paler. Disc of the pronotum brownish; lateral lobes almost black, with a distinct, widened below, pale border along their hind margin. Elytra brownish, with dark small square spots on the middle. Hind femora unicolorous, reddish brown. Abdomen almost black above and somewhat lighter below. Length of body 25 mm., of pronotum 7·8, of elytra 17, and of posterior femora 25.

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* Bolivar, T., "Diagnoses de Ortópteros nuevos," An. Soc. Españ. xix. 1890, p. 327.

This beautiful species belongs to the group of *Metrioptera brachyptera* (L.), but differs strongly from all representatives of that group in its larger size, more developed elytra and wings, structure of the pronotum, and in the coloration.

This is the second Japanese species of the genus *Metrioptera* (the other species is *M. bonneti*, Bol.).

11. *Tettigonia orientalis*, Uv.—2 ♀ ♀.

These two females agree well with Uvarov's description of this species *.

12. *Tettigonia viridissima*, L.—1 ♂.

This widely distributed Palæarctic species has not been recorded previously from Japan, but its occurrence in that country is not unexpected, because it is known from Eastern Siberia and from Korea. The specimen does not belong to *T. orientalis*, Uv., because its cerci extend well beyond the apex of the styli; the apical filiform part of the cercus is more than three times as long as the tooth; styli distinctly shorter than the filiform portion of the cerci. All these features characterise *T. viridissima*.

13. *Diestrammena goliath*, sp. n.—1 ♂. (Fig. 2)

Size large. Head with two parallel vertical sulci on the face; fastigium of the vertex divided into two well-separated small conical tubercles; (maxillary palpi broken off). Pronotum almost cylindrical, anterior margin subtruncate, posterior margin roundly projecting. Hind margin of the mesonotum also roundly projecting. Anterior femora only half again as long as the pronotum and practically as long as the head and pronotum taken together, slender; lower inner margin with very minute spines near the middle;

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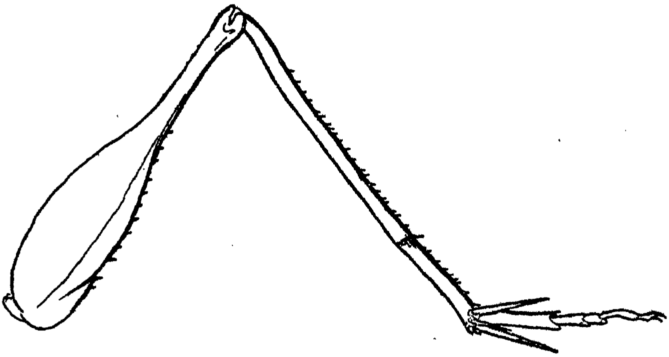
* Uvarov, B. P., "Some less-known or new Genera and Species of the Subfamilies Tettigoniinæ and Decticinæ," Trans. Ent. Soc. London, [1923] 1924, pp. 494–495, pl. xxviii. figs. 1–2.

all other armature of the anterior and middle legs as in the description of the genus*. Hind femora thick and long with 11–12 spines on lower inner margin, interspaces between which are subequal throughout and densely covered with short badly visible hairs, which are considerably shorter than spines; lower outer margin of hind femora unarmed; lower and upper margins not straight, seen in profile somewhat S-shaped, incurved. Hind tibiæ distinctly longer than hind femora; upper surface with 29–31 spines on the outer margin, and with 26–27 spines on the inner; all spines of subequal length, except one pair of decidedly longer spines on the upper surface of the apical part of tibiæ near the black transversal stripe placed less than at three-quarters of the length of tibiæ, viz., hind tibiæ are three and a half times as long as the space between their apex and these two spines. Upper inner spur of the hind tibiæ distinctly longer than the metatarsus and than the upper outer spur, and twice as long as lower inner spur; tarsal claws a little longer than third joint of tarsus. Abdomen compressed; last abdominal tergite with bow-shaped emargination; cerci as long as the hind tarsus, lyra-shaped, incurved.

Fig. 2.



Diestrammena goliath, sp. n.
Outer side of hind leg (type).

General coloration uniformly darkish brown. Lateral sides of the meso- and metanotum with dark spots; lower margin not darkened. All femora somewhat darkened at the apex; hind femora with dark and light spots on the lower surface and unicolorous above.

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* Brunner v. Wattenwyl, C., "Monographie der Stenopelmatiden und Gryllacriden," Verh. zool.-bot. Ges. Wien, xxxvii. 1888, p. 298.

Length of body 23·5 mm., of pronotum 10, of posterior femora 31.

The type is unique.

This species is very closely related to the well-described and figured *D. palpata*, Rehn, from Tonkin [*], but differs from it in somewhat larger size, not very narrowly divided fastigium of the vertex, shorter anterior femora which are only half again as long as the pronotum (in *D. palpata* twice as long as the pronotum), shape of hind femora, which in *D. palpata* have almost straight lower and upper margins; interspaces between spines on lower inner margin of hind femora subequal in length throughout (in *D. palpata* closely placed in basal portion of hind femora and sparsely in apical part); hind tibiæ on upper margins with only 26–31 spines (in *D. palpata* 30–34); upper inner spur distinctly longer than the metatarsus and upper outer spur as long as the metatarsus (in *D. palpata* upper inner spur as long as the metatarsus and upper outer spur shorter than metatarsus).

14. *Tachycines asynamorus*, Adel.—1 ♀.

The country of origin of this species, described by Adelung [†] from hot-houses in Petrograd, has not been sufficiently known during a long time; Chopard [‡] recently recorded it from the Setshuan Province, China; it is known also from hot-houses in North America, from which it was recorded by some authors under the names *Diestrammena marmorata*, Haan, *D. japanica*, Blatchley, and *D. unicolor*, B.-W. [§]. Some authors supposed that *T. asynamorus* originates from Japan, and this supposition seems to be justified by the present record.

The specimen agrees well with Adelung's description; I have also compared it with topotypic specimens from Petrograd, kindly sent me by Miss E. Miram, Zoological Museum of the Russian Academy of Sciences, and I have found no difference between the Japanese and the topotypic specimens.

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[*] Rehn, J. A. G., "Descriptions of Five new Species of Orthoptera from Tonkin," Proc. Acad. Nat. Sci. Philad. 1906, pp. 290–292, fig. 7.

[†] Adelung, N., "Beitrag zur Kenntnis der paläarctischen Stenopelmatiden," Ann. Mus. Zool. Acad. Imp. Sci. St. Pétersb. vii. 1902, pp. 56–60.

[‡] Chopard, L., "Sur l'origine de *Tachycines asynamorus*, Adel.," Bull. Mus. Hist. Nat. Paris, 1914, pp. 234–235.

[§] See Hebard, M., "Orthoptera of South Dacota," Proc. Acad. Nat. Sci. Philad. lxxvii. 1925, p. 146.

15. *Gryllacris* sp.—1 ♂.

This is probably an undescribed species, but I have no material for comparison and for the determination of its systematic position. It is characterised by the following features:—

Size medium for the genus. Head as broad as the pronotum; vertex broad, one and one-half times as broad as the proximal antennal joint; its surface convex. Face smooth, with a feeble impression between upper and lower ocellæ, not punctulate; ocelli large, of equal diameters. Pronotum as broad as long, with the anterior margin somewhat projecting forwards; anterior furrow near anterior margin of pronotal disc very feeble, on the lateral lobes strong; posterior transverse furrow represented only on lateral lobes and forming there with the anterior furrow a V-shaped impression; median longitudinal sulcus very fine, occupying only the median convex portion of pronotal disc; hind margin of pronotal disc straight; humeral sinus feeble. Tegmina broad, regularly narrowing to the apex, not strongly but distinctly extending beyond the apex of hind femora and abdomen, once and one-half as long as the former. Anterior and median tibiæ with four spinules on each lower margin. Hind femora short; outer lower margin with seven, inner with 3–4 subequal spines. Anal segment above with a distinct longitudinal convexity in the anterior portion and with a strong narrow longitudinal impression along its hind portion: hind portion forming two globose projections, armed near apical portion of the longitudinal impression with two practically straight, minute spinulæ; cerci elongate and very slender, somewhat impressed on the middle of the apical half. Subgenital plate distinctly roundedly emarginate on its median portion, with somewhat projecting rounded lobes; styli of medium size, cylindro-conical, somewhat shorter than the interspace between their base and base of median emargination of subgenital plate.

Shiny. General coloration testaceous. Antennæ yellowish, with very sparse dark wings. Apices of the mandibulæ black; occiput and vertex unicolorous: ocellæ yellow. Pronotum without any admixture of dark or black colour. Elytra ferruginous, with the veins and veinlets in basal part not differing from the ground-colour; apical elytral portion not so ferruginous as the basal one, somewhat lighter, with feebly darkened veins and veinlets. Wings hyaline without any fasciæ or admixture of dark colour; veins and veinlets light yellowish or partly brownish.

Anterior and median tibiæ with admixture of a dark colour on the upper surfaces; apices of spinulæ of the anterior and median tibiæ black; femoral spines ferruginous in basal part, and black in apical ones; all other portions of legs uniformly testaceous.

Length of body 23·2 mm., of pronotum 6·7, of elytra 23·5, and of hind femora 15.

The species probably belongs to *G. dubia*, Le Guill., and *G. oceanica*, Le Guill., group, but differs from both in many features. From two more northern species, viz., *G. maculicollis*, Serv., and *G. maculipes*, Walk. (from Korea), it differs strongly in the quite different coloration and in smaller size.

Gryllidæ.

16. *Homœgryllus japonicus* (Haan).—1 ♂.

17. *Liogryllus bimaculatus* (Degeer), ab. *ater*, Walk.—1 ♂ and 1 larva.

The specimen of ♂ has dark unicolorous elytra, and I determined it as ab. *ater*, Walk.

Acrididæ.

18. *Acrida turrita*, L.—1 ♂, 2 ♀ ♀, and 4 larvæ.

19. *Chrysochraon japonicus*, Bol.—1 ♂.

20. *Chorthippus* (*Stauroderus*) *bicolor* (Charp.).—1 ♀.

This specimen is somewhat larger than the European ones, and is like specimens of the same species from South Ussury Country.

Measurements of this specimen are as follows:—Length of body 27 mm., of pronotum 4·9, of elytra 18·6, and of hind femora 15.

21. *Œdaleus infernalis*, Sauss.—1 ♂.

22. *Gastrimargus marmoratus* (Thunb.).—1 ♂.

23. *Locusta migratoria*, L., ph. *danica*, L.—2 ♂ ♂, 4 ♀ ♀, and 4 larvæ.

All specimens are typical ph. *danica*.

24. *Oxya japonica*, Will.—1 ♀.

This species was described by Willemse [*] from a single male, determined previously by Brunner von Wattenwyl as *Oxya vicina*, Br.-W.[†]. The specimen agrees well with the description by Willemse, except in the elytra, which are somewhat shorter and not reaching to the apex of hind femora. This feature is subject to variation, as shown by Hebard [‡], who recently recorded this species from Japan also under the name of *O. vicina*.

25. *Patanga japonica* (Bol.).—1 ♂ and 1 ♀.

These two specimens are a little smaller than those recorded by Hebard [§]. Length of body, ♂ 32 mm., ♀ 41·5, of elytra, ♂ 28, ♀ 39, of hind femora, ♂ 17·5, ♀ 23·5. Wings in the specimens are discoloured, almost hyaline.

26. *Podisma mikado* (Bol.).—1 ♀.

This is probably a very common species in North Japan, and it has been recorded by Shiraki [‖] from South Japan; Hebard [¶] recently recorded it from Tsushima, but the specimen from that island differs from the typical ones in the structure of the elytra.

LXIV.—*On a new Species of* Labiostrongylus.
By Colonel W. A. Wood.

In the stomach-contents of a small red species of kangaroo (*Macropus woodwardi*) the writer found, among many other worms, one specimen of a large, straight, stout worm.

On examination, this proved to resemble very closely *Labiostrongylus labiostrongylus* (Yorke, 1926), but differed in some particulars.

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[*] Willemse, C., "Revision der Gattung *Oxya*, Serv.," Tijdschr. Entom. lxviii. 1925, pp. 31–32, fig. 28.

[†] Brunner von Wattenwyl, C., "Révision du système des Orthoptères," Ann. Mus. Civico Genova, xiii. 1893, pp. 152–153.

[‡] Hebard, M., "Studies in Japanese Acrididæ," Trans. Amer. Ent. Soc. l. 1924, p. 217.

[§] Hebard, *loc. cit.* p. 218.

[‖] Shiraki, T., 'Acrididen Japans,' Tokyo, 1910, pp. 71–72.

[¶] Hebard, *loc. cit.* pp. 219–220.

The specimen is a male, the length 42 mm. The mouth is directed straight forward and is surrounded by four very large bilobed processes, and by a large simple process on each side. The buccal cavity is large and symmetrical.

The œsophagus is slender, is 7·5 mm. long; it has a slight swelling at 1·65 mm. from the anterior extremity; shortly behind this it commences very gradually to thicken to form an elongated club-like swelling, the widest point of which is at its posterior extremity.

The cervical papillæ are hair-like and situated far forward at 0·930 mm. from the anterior extremity.

The bursa has two large lateral lobes clearly marked off from the dorsal lobe and from the two large ventral lobes.

The dorsal lobe is comparatively small.

The bursa has the following formula:—

Ventral ray long, cleft distally.

Externo-lateral short, does not reach edge of bursa.

Medio- and posterior-laterals long and fused for the greater part of their length.

Externo-dorsal short and, arising with the laterals from a common trunk, does not quite reach edge of bursa.

Dorsal ray divided for about half its length from the common trunk; a long branch is given off on either side.

There are two spicules which are equal and similar, are long and thin with striated alæ and simple points; the length of each spicule is 13·2 mm.

A gubernaculum is present.

The genital cone is prominent.

The accessory genital cone is well developed and has prominent finger-like appendages.

No specimen of a female was found.

This worm differs from the type-species in that there are no small ventral and dorsal processes to the mouth-collar, that the spicules are very much longer, being 13·2 mm. as compared with 5·2 mm. in *L. labiostrongylus*, and that in the male bursa the externo-lateral ray is proportionally longer.

In the writer's opinion, this is a new species of the genus *Labiostrongylus*, and he proposes the name *Labiostrongylus longispicularis*.

REFERENCE.

YORKE & MAPLESTONE. 1926. 'The Nematode Parasites of Vertebrates,' p. 67.

LXV.—*A Note on* Rugopharynx australis (*Monnig*, 1926).

By Colonel W. A. WOOD.

IN 1926 Monnig published in 'Transactions of the Royal Society of South Africa,' vol. xiii. p. 293, a description of a nematode from *Macropus rufus*, under the name *Spirostrongylus australis*; this name was afterwards (1927) changed to *Rugopharynx australis*, the name *Spirostrongylus* being preoccupied.

In January of this year the writer had sent to him the internal organs of several small red kangaroos (*Macropus woodwardi*), which had been imported some months previously into this country from Western Australia. In the stomach-contents of these he found very large numbers of worms closely resembling *R. australis* (Monnig, 1926). The worms are small, straight, stout, colourless, and taper towards both extremities. In length the males are 8–9 mm., the females 10–11 mm., in thickness the males are ·3 mm. and the females ·5 mm.

The cuticle is very finely striated transversely.

The mouth is directed straight forward.

The mouth-collar has two lateral and four submedian papillæ, all these being short and inconspicuous.

The buccal capsule is short and cylindrical, is wider than deep, the depth being only 0·004–0·005 mm.

A corona radiata is present, though difficult to make out, but when the head is viewed from the front it shows as a large number of fine elements (about 40).

The buccal capsule leads into a pharynx or vestibule ·04–·05 mm. deep. The pharynx is deeper than wide, has very heavily chitinized walls which are irregularly transversely ringed, this marking is very conspicuous, the pharynx opens into the œsophagus.

The œsophagus is long and fairly slender, its anterior half having at, or a little behind, its posterior end a very slight swelling; the posterior half is at first somewhat narrower than the anterior portion, then it swells rapidly to form a well-marked bulb-like thickening at its posterior end.

Cervical papillæ are present, pin-like, and situated 0·17 mm. from the anterior extremity.

The nerve-ring is at the anterior swelling of the œsophagus.

The excretory pore is a little behind this level.

The intestine is straight and contains a considerable amount of dark pigment.

Male.—The bursa is short, stout, and closed ventrally.

The bursal membrane of the lateral and ventral lobes is covered on the inside by a large number of small sharp-pointed papillæ, making it appear like the surface of a coarse rasp.

The bursa has the following formula :—

Ventral rays long, equal, and parallel, fused for half their length.

Externo-lateral shorter than the other laterals and does not reach edge of bursa.

Medio- and posterior-laterals long, equal, and parallel, fused for a considerable portion of their length.

Externo-dorsal does not quite reach edge of bursa, arises separately from the dorsal, and is within the lateral lobe.

Dorsal ray divided for half its length, each division giving off almost at once a stout branch at right angles ; this branch bends forward and inwards soon after its origin.

Spicules two, equal and similar ; long, straight, simple rods, with broad transversely striated alæ, in length 1·88 mm. The spicules converge before reaching the cloacal opening ; viewed dorsally there is a heart-shaped piece of chitinous material between them, its apex being just at their point of convergence ; there are chitinous walls to the spicular canal.

Female.—The posterior extremity narrows considerably just anterior to the vulva; the narrowing continues rapidly from vulva to anus, the worm ending in a fairly long narrow tail with an acutely pointed end.

The vulva is ·150 mm. in front of the anus, the anus ·450 from the tip of the tail. This latter measurement varies considerably in different individuals.

Ova large and thick-shelled, in some cases contain embryo when found in the vagina, in some examined when fresh the nucleus was in the mulberry stage of development.

The writer's specimens are generally a little smaller than those described by Monnig ; he found that in fresh as well as in most preserved specimens there is a distinct transverse striation of the cuticle, that cervical papillæ are present, long and pin-like, of the usual *Trichonema* type, and that there is a very shallow buccal capsule and a corona radiata.

In all other respects the above-described worm exactly resembles Monnig's worm, even to the pieces of transparent material described by him as situated between the branches of the dorsal ray. These pieces appear to differ somewhat in shape in each specimen examined, and are sometimes missing, they would appear to be comparable to the accessory branches to the dorsal ray found in many *Trichonema.*

In the writer's opinion this worm is identical with *Rugopharynx australis*; however, the presence of a buccal capsule, a corona radiata, and a fairly large and differentiated dorsal lobe to the bursa copulatrix seem to exclude it from the Trichostrongylidæ, where Monnig has placed it, and he considers that it belongs to the Trichoneminæ.

The arrangement of its buccal capsule and its markedly ringed pharynx would seem to place it in the genus *Pharyngostrongylus*, Yorke, 1926.

This genus would not be known to Monnig when he published his paper, it having been erected by Yorke and the description published in 'The Nematode Parasites of Vertebrates,' Yorke and Maplestone (1926).

This worm would then become :—

Pharyngostrongylus australis, Monnig, 1926.

Syn. *Spirostrongylus australis*, Monnig, 1926.
Rugopharynx australis, Monnig, 1927.

LXVI.—*Notes on Fossorial Hymenoptera.*—XLIII. *On new Ethiopian* Sphegidæ. By ROWLAND E. TURNER, F.Z.S., F.E.S.

Sphex bechuana, sp. n.

♀. Nigra; mandibulis, clypeo apice, scapo, prothorace, tegulis, petiolo subtus, segmento abdominali secundo, coxis anticis intermediisque, femoribus anticis intermediisque dimidio basali infuscatis, tibiisque, posticis dimidio apicali infuscalis, ferrugineis; pronoto latitudine duplo latiore, transverse acute striato, nitido; alis fusco-hyalinis.

Long. 24 mm.

♀. Clypeus at the base and sides sparsely clothed with long pale fulvous hairs, the median portion shining, with a few large punctures, the anterior margin straight. Head coriaceous, with large scattered punctures, clothed with delicate silver pubescence. Inner margin of the eyes slightly convergent above. Pronotum long, almost half as long as its median breadth, very strongly transversely striated, margined anteriorly, the striæ numbering five or six, more or less interrupted in the middle, the space between the striæ shining. Mesonotum strongly transversely striated, the striæ interrupted in the middle by a very deep longitudinal sulcus, which becomes subobsolete posteriorly, the space between the striæ shining; scutellum and metanotum strongly longitudinally striated. Median segment dull, closely transversely striated. First joint of the petiole as long as the hind femur. Claws unarmed, but with a distinct pulvillus. Second cubital cell three-quarters as long on the radius as on the cutitus; third cubital cell a little longer on the cubitus than on the radius; second transverse cubital nervure straight, third strongly curved outwardly.

Hab. Ghanzi, Mongalatsila, North Bechuanaland; January 18, 1925 (*J. Maurice*).

Easily distinguished from *S. braunsi*, Turn., by the much coarser sculpture of the pronotum and mesonotum, the striæ in *braunsi* being much closer together and less elevated; the pronotum is also distinctly shorter than in *braunsi*.

Sphex insignis, Sm.

Ammophila insignis, Sm. Cat. Hym. B.M. iv. p. 213 (1856). ♀ ♂.
Ammophila egregia, Mocs. Ent. Nachr. vii. p. 327 (1881). ♀ ♂.

These are identical, so Mocsary's name must sink.

As in some other species of the genus the colour varies very much locally, the contrast between race *transvaalensis*, Cam., and race *litoralis*, Arn., being very marked. Similarly, a specimen of *S. beniniensis* taken by me at Mossel Bay has the second abdominal segment bright ferruginous, also the tibiæ, tarsi, and the greater part of the femora; another specimen of the same species from the Some Forest, Uganda, has the abdomen almost entirely dull ferruginous covered with silver pile. The differences in *S. tenuis* are noticed by Arnold.

Thyreopus (*Neodasyproctus*) *basutorum*, sp. n.

♀. Nigra, nitida; scapo, pronoto linea interrupta, tergitis 2–5 macula utrinque, tibiisque anticis intermediisque supra flavis; tarsis anticis pallide ferrugineis; tibiis anticis subtus fusco-ferrugineis, calcaribus albidis; alis pallide fusco-hyalinis, iridescentibus; venis nigris.

Long. 9 mm.

♀. Clypeus densely clothed with silver pubescence, with a low carina from the base to near the apex, where it branches into two, forming a small, margined, triangular area, the angles of which are produced and form two small teeth on the anterior margin. Second joint of the flagellum fully half as long again as the first, a little shorter than the third, and only about half as long again as its apical breadth. Scape without a carina in front, the facial concavity rather shallow and not marginate above. Front closely and rather strongly punctured, more or less reticulate above the facial concavity, vertex much more finely and sparsely punctured, the space behind the eyes and the temples almost smooth. Posterior ocelli a little further from the eyes than from each other. Pronotal collar with a distinct depression in the middle, interrupting the marginal carinæ; the space between the carinæ forming the anterior and posterior margins flat, not elevated as in *kohli*. Mesonotum strongly, but rather sparsely punctured; mesopleuræ smooth and shining; scutellum sparsely punctured anteriorly, the posterior portion clothed with close-lying hairs giving an appearance of longitudinal striolation; metanotum opaque. Median segment rather finely punctured, with a transverse clathrate groove at the base and a smooth median groove from base to apex; the median area distinctly defined. Abdomen smooth and shining, the puncturation microscopic. Petiole nearly half as long again as the second tergite, only feebly clavate. Hind tibiæ with a row of five small teeth on the outer margin.

Hab. Van Reenen, Natal; 6000 ft.; January 24, 1927 (*Turner*). 1 ♀.

This species is very distinct from *kohli*, Arn., the only species of the group hitherto described; differing from it in the much finer sculpture, which does not obscure the basal area of the median segment, in the smooth mesopleuræ, and in the bidentate clypeus as well as in other details; but agrees with it in the neuration, the tridentate mandibles, and in other subgeneric characters.

Tachytes calvus, sp. n.

♀. Nigra; abdomine rufo-ferrugineo, area pygidiali aureo-pilosa; tarsorum articulis duobus apicalibus brunneo-ferrugineis; alis hyalinis, venis fusco-ferrugineis.

Long. 11 mm.

♀. Interocular distance on the vertex equal to the length of the second joint of the flagellum; galea shorter than the scape. Head and thorax closely and minutely punctured, almost without pubescence, the mesonotum and vertex entirely bare. Median segment without pubescence, the declivity finely transversely striate, the dorsal surface finely and irregularly obliquely striated. Second sternite closely and microscopically punctured, shining. Tergites without apical bands of pubescence. Pygidial area elongate, narrowly rounded at the apex. Anterior metatarsus with five spines.

Hab. Okahandja, S.W. Africa; February 1928 (*Turner*). 2 ♀♀.

This may possibly prove to be a dwarf race of *T. sjöstedti*, Cam., agreeing in most structural features with the race *formosa*, Arn., but differing in the entirely red abdomen, in the absence of pilosity, and much reduced pubescence; also, apparently in the sculpture of the dorsal surface of the median segments.

Tachytes kristenseni, Turn.

Tachytes kristenseni, Turn. Ann. & Mag. Nat. Hist. (8) xx. p. 30 (1917). ♀.

Described from a single female, taken at Harar, Abyssinia. I took a pair of this species at Okahandja, S.W. Africa; the male in December 1927, the female in March 1928. I have seen no other specimens.

Tachytes (*Holotachytes*) *hospes*, Bingh.

Tachytes hospes, Bingh. Journ. Bombay Nat. Hist. Soc. xii. p. 119 (1898).

This is a subspecies of the West African *T. dichrous*, Sm., differing in the somewhat narrower pygidial area in both sexes, but not in the interocular distance nor in other characters. The series from Colonel Nurse's collection is now in the British Museum, and I have also seen a specimen from Southern Iraq.

Miscophus deserticolus, sp. n.

♀. Nigra, nitida; mandibulis basi, tibiis tarsisque brunneo-ferrugineis; clypeo pleurisque argenteo-pubescentibus; alis hyalinis, venis nigris, tegulis fuscis.

Long. 5 mm.

♀. Clypeus opaque, closely and finely punctured, the apical margin transverse, very feebly convex, and without a carina. Head, thorax, and median segment shining; mesopleuræ opaque, coriaceous, sides of the median segment with a few delicate striæ; head and mesonotum with a few microscopic punctures; abdomen smooth and shining. Front slightly concave as far from the base of the antennæ as the length of the scape, the concave area sharply transversely divided above from the rest of the head, but without a distinct marginal carina. Ocelli in an equilateral triangle, the posterior pair much nearer to the eyes than to each other. Eyes separated on the vertex by a distance a little greater than the length of the first and second joints of the flagellum combined, diverging considerably towards the clypeus. First joint of the flagellum very little longer than wide, second a little longer than the third and more than twice as long as the first. Pronotum more than two-thirds as long as the mesonotum, narrowed anteriorly and microscopically transversely striate, the dorsum of the median segment with similar sculpture. First abdominal segment narrow and petiolate, half as long as the thorax and median segment combined, the petiole as long as the gradually broadened apical portion of the segment. Legs long and slender, no comb on the anterior tarsus, hind metatarsus shorter than the tibia by one-fifth and as long as the rest of the tarsus. First recurrent nervure received considerably before the middle of the first cubital cell, second at the middle of the second cubital cell. Petiole of the second cubital cell very short, almost obsolete, the cell triangular, the outer side incomplete near the cubitus.

Hab. Swakopmund, S.W. Africa; April 3, 1928 (*Turner*).

In the long pronotum this resembles *M. cyanescens*, Turner, but is very distinct in colour, in the shining surface, the long petiole, and other details. In the same spot I took *M. kohli*, Brauns, and a species which seems to be a form of *M. pseudonotogonia*, Brauns. The form of the first segment is similar to that of *M. kohli*, but is more elongate.

Miscophus arnoldi, sp. n.

♂. Niger, opacus; mandibulis fusco-ferrugineis; tergitis duobus sternitisque tribus basalibus rufo-ferrugineis; alis hyalinis, venis fuscis, tegulis brunneis; cellula cubitali secunda minima, subobliterata.

Long. 3·5 mm.

♂. Clypeus convex, slightly produced in the middle of the anterior margin. Head and thorax closely and finely reticulate-punctate, with sparse silver pubescence, which is absent on the vertex and mesonotum. Ocelli in a rather wide triangle, the posterior pair further from each other than from the anterior, and separated from the eyes by a distance equal to about one and a half times their own diameter. Eyes only slightly convergent towards the vertex, interocular distance equal to the combined length of the three basal joints of the flagellum plus half the fourth. First joint of the flagellum longer than broad, a little more than half as long as the second. Collar of the pronotum very short; median segment narrowed posteriorly, a little shorter than the mesonotum, the sculpture similar to that of the thorax, but a little coarser, with a longitudinal groove. Abdomen subsessile; microscopically punctured, the first tergite slightly constricted at the apex. Second cubital cell almost obsolete, first recurrent nervure received just beyond the middle of the first cubital cell.

Hab. Matjesfontein, Cape Province; November 1928 (*Turner*). 1 ♂.

In sculpture this resembles *M. kriechbaumeri*, Brauns, but is without the golden scales characteristic of that species, the pronotum is also much shorter, and the first tergite is not constricted in *kriechbaumeri*. The subobsolete second cubital cell is a unique character.

LXVII.—*The Phylogeny of the Cirripedes* Creusia *and* Pyrgoma. By THOMAS H. WITHERS, F.G.S.

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[Plate X., & Plate XI. figs. 1–4.]

THE Cirripede *Pyrgoma* was considered by Darwin to be a further development of *Creusia* brought about through the complete coalescence of the four original compartments. In an earlier paper (Withers, 1926, Ann. & Mag. Nat. Hist. (9) xvii. p. 4) it was said that the geological distribution apparently failed to throw any light on this, because forms ascribed both to *Creusia* and *Pyrgoma* range from Miocene to Recent. The opinion was expressed, however, that a re-examination of the geologically earliest species described as *Pyrgoma* would result in showing that these forms are nearer to the *Creusia* type—that is, with the compartments either separate or not completely fused. It was also considered probable that only the Pliocene *Pyrgoma anglicum* among the fossil species should be rightly referred to *Pyrgoma*.

On my request for the loan of any material labelled as *Pyrgoma* from the Miocene of Bordeaux, M. J. Duvergier very kindly sent me several specimens. Certain of these had been described by the late Prof. G. de Alessandri (1922, Act. Soc. Linn. Bordeaux, lxxiv. pp. 226–229), and an examination of these led me to ask also for the loan of the specimens described by him (*tom. cit.* p. 223, pl. i. figs. 13–18) as *Chelonibia duvergieri.*

De Alessandri's specimens show how much his conclusions need revision; and they not only bear out the views expressed by me regarding the Miocene forms of the *Creusia-Pyrgoma* type of barnacle, but throw still further light on their phylogeny. Two forms are represented, and are found embedded in the coral *Porites incrustans,* in one case closely associated (Pl. XI. fig. 3). Both species are found in the Burdigalian of Mandillot, near Dax, and in the Aquitanian of Baour, near Mérignac.

One, a multi-ribbed depressed form, belongs to the species *Creusia rangi,* Des Moulins; it has four separate compartments with radii, and therefore de Alessandri was wrong in describing it as a *Pyrgoma.* The other represents an earlier stage of development than *Creusia,* and is referred to the genus *Balanus.* It is a sparsely-ribbed depressed form, having six compartments with radii, and examples were described and figured by de Alessandri as *Pyrgoma anglicum* and *Chelonibia duvergieri.* Opercular valves have been found only in the second form.

Family **Balanidæ.**

Subfamily *BALANINÆ.*

Genus BALANUS, E. M. da Costa.

1778. *Balanus,* E. M. da Costa, Hist. natur. Testac. Britanniæ, p. 248.

Balanus (Balanus) duvergieri (de Alessandri).
(Pl. X. figs 1–10 ; Pl. XI. fig. 3 *b*.)

1922. *Chelonibia duvergieri,* de Alessandri, Act. Soc. Linn. Bordeaux, lxxiv. fasc. ii. p. 223, pl. i. figs. 13–18.

1922. *Pyrgoma anglicum,* G. B. Sowerby: de Alessandri, *tom. cit.* p. 226, pl. i. fig. 3.

Diagnosis.—A *Balanus* with the shell depressed, and with the walls folded into comparatively wide rounded ribs, which stand out prominently towards the periphery ; orifice small, broadly oval. Scutum with adductor ridge short and prominent. Tergum elongate, distinctly beaked, with the spur comparatively narrow, its end regularly rounded.

Distribution.—Lower Miocene (Aquitanian): Baour, near Mérignac. Lower Miocene (Burdigalian, lower) : Mandillot, near Dax (Gironde), France.

Lectotype.—The larger of the two shells figured by de Alessandri (1922, pl. i. fig. 13), here re-figured (Pl. X. fig. 4), is selected.

Remarks.—De Alessandri founded this species on some shells from Dax embedded in pieces of the coral *Porites incrustans*, and he also figured two separate compartments (figs. 15–18). He referred these fossils to the genus *Chelonibia*, a group of barnacles with a membranous base, and found living on manatees, turtles, and crabs. Leaving out of consideration the fact that the present form lives in coral, the walls are not thick and massive, and the sheath does not reach to the base, and could not have formed the whole inner wall of the body-chamber, as in *Chelonibia*. There is also no sign of channels formed in the lower margin of the sheath—a feature so characteristic of *Chelonibia*. As a matter of fact, if de Alessandri had examined carefully the piece of coral which fitted on to a shell (Pl. X. fig. 5) on the other side of one of his syntypes (fig. 14), he would have found that there was present a cup-shaped calcareous basis (see Pl. X. fig. 6). Another broken specimen shows part of the calcareous basis in actual contact with the shell, but it is not certain that de Alessandri saw this specimen. Except then for the coincidence of this form having, like *Chelonibia*, six compartments to its shell, there is no agreement with that genus.

De Alessandri (*tom. cit.* p. 226, pl. i. fig. 3) figured as *Pyrgoma anglicum* a specimen from the Aquitanian of Baour, near Mérignac, agreeing in every respect with the above material from Dax described by him as *Chelonibia duvergieri*. *Pyrgoma anglicum* is one of the most highly evolved of the barnacles of the *Creusia-Pyrgoma* type, for the compartments are completely, or almost completely, fused ; its shell is steeply conical. Not only is the present shell much depressed, but it has six separate compartments furnished with radii, and is therefore far removed from *Pyrgoma anglicum*.

It is difficult to understand how de Alessandri could have overlooked the structure of these fossils, especially since he referred one of them to *Pyrgoma*. Actually they represent a species of *Balanus* leading to *Creusia* and *Pyrgoma*.

Description.—Shell depressed, broadly oval in outline, narrower at the carinal end. Walls folded into rather broad, rounded, irregular, radiating ribs, the intervening depressions becoming deep towards the periphery ; sometimes solid, and sometimes with comparatively large, irregular, rounded pores, divided by septa, near the base. Minute tubercles can be detected along the growth-ridges. Orifice broadly oval. Basis shallowly cup-formed, depth about the height of the shell or a little deeper, with comparatively large pores. Inner surface of parietes with numerous sharp ribs, which stand out prominently, and mostly extend to the sheath; these ribs are finely denticulated towards the base, and in the rostrum number from twenty-two to twenty-four. Lower edge of sheath projects freely, and is continuous as in *Creusia* and *Pyrgoma*. Sutural edges of radii rather broad and coarsely septate. Rostro-carinal length of larger shell, the holotype (Pl. X. fig. 4), 13·6 mm.; width 11·4 mm. Rostro-carinal length of shell (Pl. X. fig. 1) 19·3 mm.; width 14·5 mm.

Scutum triangular, basal margin curved and protuberant. Adductor and articular ridges separated from each other, the adductor ridge sharp and prominent, short, extending little more than half the length of the valve from the apex. Adductor muscle pit shallow, and the cavity for the depressor muscle is wide and shallow, and marked with feeble longitudinal ridges. Outer surface ornamented with regular close-set growth-ridges.

Tergum triangular, elongate, width one-third the length, somewhat flat, with a slight longitudinal furrow, the growth-ridges coarse. Carinal margin much shorter than the basal. Apex acute, distinctly beaked. Articular ridge long, low and broad, well removed from the scutal margin. Spur short, close to the scutal margin, about one-third the width of the valve, the end regularly rounded. The tergum on which this description is based has its outer basal half obscured by a secondary deposit of carbonate of lime, which extends also on to the inner surface and projects beyond the scutal margin.

Associated with *Balanus duvergieri* and *Creusia rangi* at Baour, near Mérignac, and Mandillot, near Dax, are some small barnacles (Pl. XI. figs. 1, 2, 3 *a*) with six compartments, the shell having a rostro-carinal diameter of about 4·5 mm. These shells are not so depressed as in *B. duvergieri*, and the walls are but weakly folded near the periphery. The tergum (Pl. X. figs. 11, 12) is triangular, comparatively wide, width about one-half the length, thin and flat, the growth-ridges comparatively coarse, with no trace of a longitudinal furrow. Carinal margin about the same length as the basal. Apex acute, somewhat beaked. Articular ridge short, slight, but sharply raised, situated close to the scutal margin. Spur short, close to the scutal margin, about half the width of the valve, its end obliquely truncate. So far as its characters can be observed, a second tergum closely attached to the inside of a shell from Dax in the British Museum (In. 25802, R. F. Tomes coll.) agrees with this description. It may be that, in spite of the more conical shape of the shell and the differences shown by the terga, these shells represent the young stage of *B. duvergieri*. Whether this is so or not, it seems advisable to await further material rather than describe them as a new species. They certainly agree with *B. duvergieri* in having minute tubercles along the transverse growth-ridges, but in both cases this may be due to the barnacle having moulded itself on the coral during growth.

Comparison with other Species.—*Balanus duvergieri* is quite a distinct species, and, except for its six compartments, it has much in common with the genus *Creusia*, more especally the species *C. spinulosa*, Leach. While in the characters of the compartments and scutum it differs much from *Balanus* (*Balanus*) *spongicola*, Brown, it somewhat resembles that species in the shape of the tergum; the articular ridge, however, is much more prominent and the apex more beaked.

Genus CREUSIA, Leach.

1817. *Creusia*, Leach, Journ. Physique, lxxxv. p. 68.

Creusia rangi, Des Moulins. (Pl. XI. figs. 3 *c*, 4.)

1867. *Creusia rangi*, Des Moulins, Act. Soc. Linn. Bordeaux, xxvi. p. 302 [no figure].
1873. *Pyrgoma multicostatum*, Seguenza, Atti Accad. Pontaniana, x. p. 319, pl. ii. figs. 7, 7*a*–*f*.
1893. *Creusia fuchsi*, Procházka, Rozpravy Česko Akad. Cis. Františka Josepha, (2) ii. p. 18, pl. ii. figs. 3 *a*–*d*.
1922. *Pyrgoma rangi* (Des Moulins): J. Duvergier, in de Alessandri, Act. Soc. Linn. Bordeaux, lxxiv. p. 228, text-fig.

Diagnosis.—Shell depressed, almost circular in outline, with the walls folded into narrow, closely approximating ribs; orifice small, narrowly oval.

Distribution.—Lower Miocene (Aquitanian): La Flotte, near Bazas, and Baour, near Mérignac. Lower Miocene (Burdigalian): Mandillot, near Dax.

Remarks.—De Alessandri (1910, Abh. k.-k. geol. Reichsanst. xxii. p. 126) has suggested that this species is the same as *Creusia fuchsi*, Procházka (1892), and (1922, p. 225) considered *Pyrgoma multicostatum*, Seguenza (1873), also as a synonym. In the absence of specimens definitely referable to *Creusia fuchsi* and *Pyrgoma multicostatum*, and without a comparison of the opercular valves of these forms, it does not seem possible to arrive at a definite opinion on these points. The French form has four compartments with radii, and is therefore a typical *Creusia*.

Description.—Shell depressed, almost circular in outline, the walls folded into numerous narrow, closely approximating, radiating ribs, which stand out more prominently at the periphery. Walls thick, apparently solid. Orifice small, narrowly oval. Inner surface of parietes with comparatively few somewhat sharply rounded ribs, which stand out prominently and extend to the sheath; the ribs are coarsely denticulated towards the base, and in the rostrum number about ten. Lower edge of sheath projects freely but slightly. Sutural edges of septa comparatively narrow, coarsely septate.

Basis varying in length from a little less to a little more than the width of the shell; porose.

Rostro-carinal length of largest specimen 10·3 mm.; width 9·5 mm.; specimen figured (Pl. XI. fig. 4) 8·6 mm.; width 8·7 mm.

The opercular valves have not been seen by me, and Des Moulins's description of them is too general to be of use.

DISCUSSION.

The Balanomorph, or acorn, barnacles are divided into the two families, Chthamalidæ and Balanidæ, and in each of those families there are genera in which eight wall-compartments can be traced. It has, therefore, been assumed that the ancestral acorn-barnacle was a form with eight wall-compartments. To some extent this assumption is borne out by the palæontological evidence, for, if one combines the characters shown by the Cretaceous sessile Cirripedes *Proverruca* and *Brachylepas*, primitive genera and undoubtedly derived from stalked forms, we arrive at a form which must have had eight wall-plates, with possibly one or more whorls of imbricating plates at the base.

In both families of the Balanomorpha there has undoubtedly been similar, and quite independent, reduction by the elimination or fusion of certain of the wall-compartments.

In the Chthamalidæ, *Catophragmus* has eight wall-compartments with several whorls of imbricating plates at the base; *Octomeris* has eight compartments only; *Pachylasma* has eight compartments in the young, but six in the adult; and in *Chamæsipho* six compartments have been detected in a very young shell, although there are only four in the adult, and these are virtually fused together into a single shell.

In the Balanidæ *Chelonibia* has really eight compartments, for the rostrum is only incompletely fused with the rostro-laterals, and this fusion is much less complete in a Miocene form of *C. caretta*. *Balanus*, probably by the elimination of the rostrum and the fusion of the rostro-laterals, has only six compartments, and *Pyrgoma* represents the extreme in reduction, for the shell consists externally of a single piece, the compartments having been fused together. Evidence that the shell originally was formed of separate compartments is shown by sutures still to be seen in some species at the carinal end of the shell.

In certain species of *Creusia* the four compartments show evidence of fusion; and it seems to be now fairly well established that Darwin was right in assuming that *Pyrgoma* was derived from *Creusia*. Further support for this conclusion seems to be shown by the geological evidence, since none of the earlier Miocene forms can be referred to *Pyrgoma*. Moreover, Abel (1927, Verhandl. zool.-bot. Gesell. Wien, lxxvi. pp. 101–103; 1928, 'Palæobiologica,' i. pp. 13–18, pls. i., ii.) has described from the Mediterranean Miocene a number of specimens under the name *Paracreusia trolli*, gen. et sp. n. They are, however, typical *Creusia*, with four compartments; the upper surface of the shell is not illustrated, and the opercular valves are unknown.

Among the Recent species of *Creusia* and *Pyrgoma* are several that have opercular valves resembling *Balanus*, but the remainder have departed widely from the *Balanus*-type. It might be assumed from this that the earlier forms had opercular valves resembling *Balanus*, and this is borne out, in so far as the opercular valves are known, by the fossil forms. One could therefore arrive at the conclusion that the ancestor of *Creusia* was a form which, like *Balanus*, had six compartments to the shell and similar opercular valves. That is what we could reasonably look for.

It is therefore not unexpected when we find in the Lower Miocene such a form of *Balanus* as *B. duvergieri*; for, with the exception of its six instead of four compartments, it resembles *Creusia* in every way. The depressed, externally ribbed shell; the cup-shaped, and often cylindrical, basis;

and the continuous lower edge of the sheath are features typical of *Creusia,* correlated, no doubt, with intra-coralline existence; for the continuous lower edge of the sheath follows the tendency to eliminate the carino-lateral compartments, to narrow the radii, and consequently to compact the compartments. These features are paralleled in specimens referred by Darwin to his species *Balanus* (*Austrobalanus*) *allium,* which also lives in coral; on the other hand, *Balanus* (*Austrobalanus*) *flosculus,* Darwin, which does not live in coral, often has a depressed, externally ribbed shell, and a sheath similar to *Creusia,* that is, with the radii either wanting or very narrow; both forms differ from *B. duvergieri* in having parietal walls without pores, and for this and other reasons fall into other subgenera.

All this indicates that *Creusia* has not departed far from the *Balanus* stock—indeed, Nilsson-Cantell (1921, Zool. Bidrag. Uppsala, vii. p. 147) has shown that the mouthparts are similar in the two genera.

It seems, then, that certain forms of *Balanus* took to living in corals, and, for adaptation to this new environment, fused their compartments and spread their growth laterally rather than increasing their height. When they inhabited quickly growing corals they had also rapidly to lengthen the basis to prevent being engulfed, as some undoubtedly were. Some species of *Balanus,* such as *B. psittacus* and *B. crenatus* have a flat basis when growing separately, but an elongated basis when growing in groups.

Creusia and *Pyrgoma,* therefore, may be regarded as comparatively late developments of *Balanus;* and it is probable that the existing forms of *Creusia* and *Pyrgoma* were independently developed along separate lines.

LXVIII.—*The Cirripede* Chelonibia *in the Miocene of Gironde, France, and Vienna, Austria.* By THOMAS H. WITHERS, F.G.S.

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[Plate XI. figs. 5–10.]

IN 1922, de Alessandri (Act. Soc. Linn. Bordeaux, lxxiv. fasc. ii. p. 223, pl. i. figs. 13–18) described and figured under the name *Chelonibia duvergieri* certain Balanomorph barnacles from the Miocene of Dax (Gironde), France. These barnacles, however, do not belong to the genus *Chelonibia*, but, as has been shown in the preceding paper (pp. 560 *et seq.*), represent a coral-living species of *Balanus*, allied to *Creusia* and *Pyrgoma*. Nevertheless, the genus *Chelonibia* is represented in the Miocene of France, for among some fossils from Gironde sent to me for determination by M. J. Duvergier are two separate compartments belonging to two species of that genus.

So far the genus *Chelonibia* is known fossil by the species *C. depressa*, Seguenza (1876, Atti Accad. Pontaniana, x. p. 411), from the Pliocene (Astian) of Sicily; *C. hemisphærica* *, Rothpletz & Simonelli (1891, Zeits. deutsch. Geol. Ges. xlii. Hft. 4, p. 724, pl. xxxvi. figs. 2, 2 *a*, 2 *b*), from the Pliocene of Grand Canary; and *C. capellini*, de Alessandri (1906, Palæontogr. Ital. xii. p. 313, pl. xviii. figs. 3–5), from the Middle Miocene (Helvetian) and Pliocene (Astian) of Italy. The Recent *C. testudinaria*, Linnæus, has also been recorded from the Pliocene of Italy.

All these species approximate to *C. testudinaria*, and consequently, as Pilsbry (1916, Bull. U.S. Nat. Mus. xciii. p. 263) has already pointed out, do not seem to throw any light on the phylogeny of the genus.

Quite lately (Withers, 1928, Ann. & Mag. Nat. Hist. (10) ii. p. 391, text-fig.) the Recent species *C. caretta* (Spengler) has been found in the Lower Miocene (probably Upper Aquitanian), Chake Chake Beds, of Pemba Id., Zanzibar Protectorate; and the two compartments here described from the Lower Miocene of Bordeaux are equally interesting. One is of Aquitanian age, and consequently represents geologically the oldest form of *Chelonibia*. It differs from the *testudinaria* type in having solid walls. The other is of Burdigalian age, and is referred to the Recent *C. patula*, a type not hitherto found fossil. Just as this paper was being sent to press a further compartment of *C. patula* has been discovered by Dr. M. Glaessner in the Upper Miocene (Tortonian) of Kalksburg, near Vienna.

The barnacles included in the genus *Chelonibia* are found attached to manatees and turtles, except for the light-walled species *C. patula*, which is found on crabs and sometimes on *Limulus*. There are really eight compartments to the shell, for the rostrum is only incompletely fused with the rostro-lateral compartments; and in the Miocene form of *C. caretta* this fusion is much less complete. The sheath extends to the base, and forms the entire inner wall of the body-chamber. To allow of the passage of thick ribbons of corium to reach the interspaces between the radiating septa of the parietes, arched channels are formed in the lower part of the sheath. Such channels are well shown in the present specimens (Pl. XI. figs. 6, 9, 12).

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* This species was quoted by de Alessandri (1906, p. 313) as *C. emisphærica*, and the genus was misprinted by Rothpletz and Simonelli as *Chenolobia*.

Family **Balanidæ.**

Subfamily *Chelonibiinæ.*

Genus Chelonibia, Leach.

1817. *Chelonobia*, Leach, Journ. Physique, lxxxv. p. 68.

Chelonibia testudinaria, var. *solida*, nov.
(Pl. XI. figs. 5–7.)

Diagnosis.—A *Chelonibia testudinaria* differing from the type in having ribbed walls, in not having cavities or tubes extending up the parietes, and in the radii not being notched.

Distribution.—Lower Miocene (Aquitanian): Lorient, near Pessac (Gironde), France.

Holotype.—A single left lateral or carino-lateral compartment (length 9·3 mm.) in the collection of M. J. Duvergier.

Description.—Walls heavy, the compartments thick and strong. Radii well-developed, without notches; alæ well-developed, with their summits slightly oblique. Articulating edge of radii with thick transverse septa extending from a central ridge. The septa on each side of the ridge are branched slightly.

Parietes with external longitudinal ribs, about sixteen in number in the single known compartment. The inner lamina is not developed, because the shell is solid; there are consequently no cavities or tubes extending up the parietes.

Sheath slightly overhanging, with its basal edge dentated, and in the lateral compartment is formed two arched channels at the basal margin to allow the thick ribbons of corium to reach the interspaces between the radiating septa.

Septa numerous and irregular on the lower halves of the parietes; a few more regular septa extending from the periphery to near the lower edge of the sheath, their basal edges finely dentated.

Remarks.—While one is loth to give a distinctive name to such fragmentary remains, still this single compartment is of great interest, since it extends the downward geological range of the genus. Moreover, it is somewhat intermediate between *C. testudinaria* and *C. caretta.*

In the *testudinaria* type of *Chelonibia* the inner and outer laminæ of the parietal walls are connected by the main septa, and the cavities or tubes formed by the septa extend up the parietes. In the Recent *C. caretta*, as in the present form, there is no inner lamina, and it is supposed that this is due to the secondary filling up of the cavities. The present form agrees further with *C. caretta* in the ribbed walls and the absence of notches on the radii, but differs in having well-developed radii and alæ, in the position of the channels formed in the sheath, and in the more regular and continuous septa.

On the whole, the form seems closest to *C. testudinaria*, for, while there is no separation of the parietal walls into an inner and outer lamina, and consequently the walls are solid as in *C. caretta*, the position of the channels in the sheath and the more regular and continuous parietal septa are as in *C. testudinaria*, and these seem to be the more important characters. It further differs from *C. testudinaria* in the absence of notches on the radii and in being externally ribbed.

The occurrence of this fossil in the Aquitanian, earlier than any known representative of the *testudinaria* type, shows that the solid-walled type existed early in the Miocene. The separation of the parietal walls into an inner and outer lamina may well have been a later development, as is generally accepted to be the case in the genus *Balanus.*

Chelonibia patula (Ranzani). (Pl. XI. figs. 8–12.)

1818. *Coronula patula*, Ranzani, Opuscoli Scientifici, ii. pl. iii. figs. 25–28.
1854. *Chelonobia patula* (Ranzani): Darwin, Ray Soc. Monogr. Cirripedia, Balanidæ, p. 396, pl. xiv. figs. 3 *a*, 3 *b*, 4.
1916. *Chelonibia patula* (Ranzani): Pilsbry, Bull. U.S. Nat. Mus. xciii. p. 268, pl. lxiii. figs. 4, 4 *a*.

Diagnosis.—A *Chelonibia* with the shell steeply conical, very smooth and light; orifice large, generally exceeding half the basal diameter of the shell; radii broad, smooth, only slightly depressed.

Distribution.—Mediterranean Sea; both coasts of the Atlantic Ocean in tropical and sub-tropical waters; Australia; Japan.

Lower Miocene, Burdigalian: Peloua, near Saucats (Gironde), France. Upper Miocene, Tortonian, Sandstone: Kalksburg, near Vienna, Austria.

Material.—A carinal compartment (length 17·5 mm.) in the collection of M. J. Duvergier, and a right lateral or carino-lateral compartment (length 20·5 mm.) in the British Museum, In. 27570, collected by Dr. M. Glaessner.

Description.—Walls comparatively thin, but thicker than in Recent specimens of *C. patula.* Alæ with their summits slightly oblique, rounded. Articulating edge of radii, as seen from the impress on the alæ, having thick transverse septa extending from a central ridge. The septa on each side of the ridge are slightly branched.

Parietes externally smooth, marked with excessively fine, regular, longitudinal striæ, the sides comparatively widely and steeply bevelled, with an inner lamina, the thin septa projecting inwards from the edge of the inner lamina and extending to the periphery; intervening septa extend from the periphery but do not reach the inner lamina, and smaller septa extend a shorter distance from the periphery. The tubes formed by the main septa extend almost to the summit of the parietes.

Parietes finely and irregularly crenated at their base. Inner parietal surface in the carinal compartment much exceeding the length of the sheath (parietes 11·8 mm., sheath 8·5 mm.), and the peripheral edge is rectangular in outline, due possibly to interference during growth by an adjoining specimen.

Sheath overhanging, the carinal compartment with a comparatively narrow median channel, the depending sides consequently rather wide, the basal edges dentated.

Remarks.—These two specimens evidently approach very closely to the Recent species *C. patula.* The walls, however, are somewhat thicker and heavier, the parietes more steeply and widely bevelled at the sides, and the septa project inwards from the inner edge. Moreover, the sheath of the carinal compartment has the median channel narrower, and the sides wider, than in any Recent specimen seen by me, although this feature is subject to much variation. In some Recent specimens the sides of the sheath are mere depending points.

Other differential features may, of course, be present in the unknown parts of the shell of this fossil, but in the absence of further material it seems best to refer these specimens to the species *C. patula*, to which it is undoubtedly closely related.

Among the Recent specimens of *C. patula* in the Zoological Department of the British Museum two have one or two notches on the radii—these notches are numerous in *C. testudinaria.*

EXPLANATION OF THE PLATES.

Plate X.

Balanus (*Balanus*) *duvergieri* (de Alessandri). Aquitanian: Baour, near Mérignac. Burdigalian: Mandillot, near Dax.

Fig. 1. Shell. Outer surface. × 2 diam. (Figured as *Pyrgoma anglicum* by de Alessandri, pl. i. fig. 3.) Mérignac (Baour).
Fig. 2. Side-view of same, showing cup-shaped basis. × 2 diam.
Fig. 3. Inner view of same, through basis, showing details of parietal ribs. × 4 diam.
Fig. 4. Two shells, showing inner surface, on a piece of coral (*Porites incrustans*). Lectotype. × 2 diam. (Syntype of de Alessandri, pl. i. fig. 13.) Dax (Mandillot).
Fig. 5. Shell. Inner surface of broken individual from the other side of a piece of coral containing the syntype figured by de Alessandri, pl. i. fig. 14. × 2 diam. Dax (Mandillot).
Fig. 6. Cup-shaped calcareous basis which fits on to the above specimen. × 2 diam.
Fig. 7. Scutum. Outer view. × ca. 10 diam. Mérignac (Baour).
Fig. 8. Inner view of same. × ca. 12 diam.
Fig. 9. Tergum. Outer view. × ca. 10 diam. Mérignac (Baour).
Fig. 10. Inner view of same. × ca. 12 diam.

Balanus (*Balanus*) cf. *duvergieri* (de Alessandri). Burdigalian: Mandillot, near Dax.

Fig. 11. Tergum. Outer view. × ca. 10 diam.
Fig. 12. Inner view of same. × ca. 12 diam.

Plate XI.

Balanus (*Balanus*) cf. *duvergieri* (de Alessandri). Burdigalian: Mandillot, near Dax. Aquitanian: Baour, near Mérignac.

Fig. 1. Shell. Outer surface. × 4 diam. Dax (Mandillot).
Fig. 2. Shell (broken), showing rostral and lateral compartments with radial septa, and basis. × 4 diam. Mérignac (Baour).
Fig. 3. Piece of coral with broken shells of *B.* (*B.*) cf. *duvergieri* (a), *B. duvergieri* (b), and *Creusia rangi* (c). × 4 diam.

Creusia rangi, Des Moulins. Aquitanian: La Flotte, near Bazas.

Fig. 4. Shell. Outer view, showing radii. × 4 diam.

Chelonibia testudinaria, var. *solida*, nov. Aquitanian: Lorient, near Pessac.

Fig. 5. Left lateral or carino-lateral compartment. Outer view. × 4 diam.
Fig. 6. Inner view of same.
Fig. 7. Lateral-basal view of same, showing impress of sutural edge.

Chelonibia patula (Ranzani). Burdigalian: Peloua, near Soucats.

Fig. 8. Carinal compartment. Outer view. × 2 diam.
Fig. 9. Inner view of same.
Fig. 10. Inner-side view of same, showing impress of sutural edge.

Tortonian, Sandstone: Kalksburg, near Vienna.

Fig. 11. Right lateral or carino-lateral compartment. Outer view. Nat. size. Brit. Mus., In. 27570.
Fig. 12. Inner view of same.

LXIX.—*Notes on the* Diaptomidæ *of South Africa.*

By ROBERT GURNEY, D.Sc.

FROM some dried mud kindly sent to me by Mr. J. S. Darling from Bandolier Kop, North Transvaal, I have obtained a number of Entomostraca, among which are specimens of *Paradiaptomus similis*, Van Douwe. Examination of these specimens has led me to a reconsideration of the nomenclature and grouping of the South African Diaptomidæ, and I believe the result is not without interest.

The Diaptomidæ of South and Central Africa include a number of species differing very much in certain respects from the typical *Diaptomus*, and some among them have been referred to other genera. These are *Lovenula*, Schmeil (=*Broteas*, Lovén); *Paradiaptomus*, Sars; *Adiaptomus*, Cooper; *Metadiaptomus*, Methuen; but these genera are so intimately connected together and with *Diaptomus* that there is much difficulty in defining their limits.

The genus *Paradiaptomus* was founded by Sars in 1895 for *P. lamellatus*, which he afterwards found to be congeneric with *Broteas falcifer*, Lovén. Lovén's name being preoccupied, a new name—*Lovenula*—was given by Schmeil in 1898, but, as the two genera are identical, the name *Paradiaptomus* has been used to include Lovén's species. The union of the two genera has been adopted by Van Douwe (1912 (3)), Brady (1913), and Rühe (1914). Sars, however, in 1927, maintained that the two genera are distinct, and Kiefer (1928) has gone further and includes in *Paradiaptomus* a number of species hitherto referred to *Diaptomus*.

Now it is convenient to break up a large genus such as *Diaptomus*; but it is essential that new genera should be defined by easily recognised characters, and it is necessary to enquire how far these genera can be said to be well defined. Unfortunately, information regarding the mouth-parts, which are important in this connection, is not always available, but it is forthcoming for a sufficient number of typical species.

Taking first *Paradiaptomus*, Sars, as including *Lovenula*, Schmeil, and comparing with *Diaptomus* (e.g., *D. castor*) we can tabulate these differences :—

	Paradiaptomus.	*Diaptomus.*
Abdomen of female ..	Two somites.	Three.
Furcal rami of male ..	Generally asymmetrical.	Symmetrical.
Maxillipede, endopod .	Five joints, very much compressed, last two much reduced.	Five quite distinct joints, slender.
Leg 1, exopod 3......	With two outer spines.	One outer spine.
Leg 5 female, exopod 3.	Reduced to a spine.	Generally distinct.
Leg 5 male, left......	Terminal part much modified, terminal process transformed into a spine.	Terminal process blunt or finger-like.

There is no definable difference with regard to the antennule, mandible, or maxillæ.

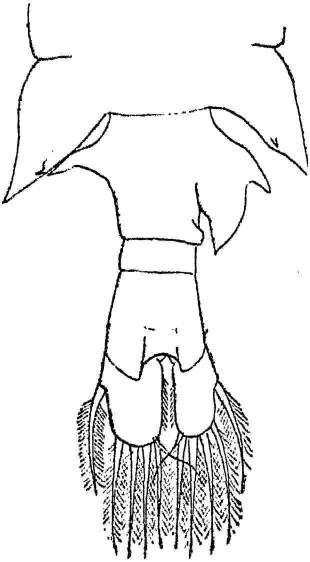
These characters, taken together, are sufficient to establish a distinction, although it is often difficult to distinguish three somites in the female abdomen in typical *Diaptomus*, and I find three distinct somites in the abdomen of my specimens of *P. similis*, Van Douwe (fig. I.).

The differences in the male fifth legs are greater than appear in the table, since it is impossible to define them precisely. On the other hand, there is no fundamental difference, and in cyclopid stage 5 they are precisely alike (fig. II.).

We can, then, separate a genus *Paradiaptomus* from *Diaptomus*. It is necessary now to see if it is possible to separate the former into two genera; to determine whether *Adiaptomus* and *Metadiaptomus* can be maintained; and, finally, to consider whether Kiefer is justified in referring certain *Diaptomus* to *Paradiaptomus*. We will deal first with *Adiaptomus* and *Metadiaptomus*.

Both these genera are characterised, according to their authors, by having antennules of twenty-six joints. In both cases the first joint is shown without a seta, and it seems probable that this "joint" is merely the process of the head to which the appendage is attached. Methuen's suggestion that an extra joint has arisen by division of the eleventh joint can be dismissed, since the arrangement of the setæ throughout is exactly the same as in a typical antennule. If an antennule of twenty-six joints should ever be discovered, it will, almost certainly, be found that the extra joint lies between joints 24 and 25, since there is reason to believe that joint 25 represents two joints fused. *Adiaptomus* in all other respects is a typical *Paradiaptomus*, and must be included therein. *Diaptomus pictus*, Brady, is evidently the same as Cooper's species.

Fig. I.



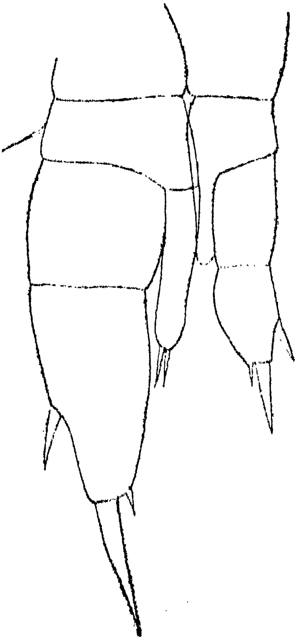
Paradiaptomus similis, Van Douwe.
Abdomen of female, showing presence of three somites and slight asymmetry of furcal rami.

In *Metadiaptomus* the slender form of the maxillipede differs entirely from that of *Paradiaptomus*, the furcal rami are symmetrical, and the abdomen of the female is of three somites. For these reasons it cannot be included in *Paradiaptomus*. It is, in fact, a form intermediate between

Diaptomus and *Paradiaptomus* and falls into the group of anomalous *Diaptomus* to be dealt with later.

We have now to consider if *Lovenula* can be separated from *Paradiaptomus*. Very detailed descriptions have been given by Sars of two typical species—*L. falcifera*, Lovén, and *P. lamellatus*, Sars, and these may be compared:—

Fig. II.



Paradiaptomus similis, Van Douwe.
Leg 5 of male in Copepodid stage V.

	Lovenula.	*Paradiaptomus.*
Thorax	Last somite separated.	Incompletely separated.
Antenna, exopod 2 ..	With three very small setæ (*Rühe*).	Three long setæ.
Maxillipede	Of great size. Spines very strong.	Of normal size.
Leg 4, exopod, terminal spine.	Very long, sabre-shaped.	About twice outer spine.
Leg 5, male, left......	Endopod rudimentary. Outer spine (on exopod) much larger than inner.	Endopod well developed. The two spines about equal.

There are two rather striking differences between the two species shown in Sars's figures; in the antenna joint 2 of the exopod is shown as having only one seta, and the form of the endopod of the maxillule is quite different. But Rühe has shown that there are really three setæ on this joint of the antenna, though they are small, and the difference between the maxillulæ is evidently due to an error in the position in which the suture of the last joint is drawn. The setæ of the joint are, it is true, shown as unusually long, but this can hardly be used as a generic character. The only real differences are the relative size of the spines on the male left leg and the different size of the maxillipedes. As Rühe has shown, there is no difference either in number of joints or in arrangement of spines in the maxillipede, and it is impossible to define a genus on such trivial characters. Sars himself does not define the genera, merely stating that there are differences in general shape, in the maxillæ and the maxillipede, but without pointing out what they are. Kiefer also offers no distinction. The structure of the fifth legs in both sexes is practically the same. I conclude therefore that the two genera must be reunited and retain the name *Paradiaptomus*.

The most difficult question remains—to determine whether certain species of *Diaptomus* should be referred to *Paradiaptomus*.

Schmeil (1898, p. 177) pointed out the resemblance of *Diaptomus alluaudi* to *Paradiaptomus*, and Rühe noted that *D. capensis* has some of the characters of that genus; but Kiefer (1928) has definitely included in it the following species :—

Metadiaptomus transvaalensis, Methuen.
Diaptomus alluaudi, De Guerne & Rich.
—— *chevreuxi*, De G. & R.
—— *colonialis*, Van Douwe.
—— *æthiopicus*, Daday.
—— *meridianus*, Van Douwe.
—— *purcelli*, Sars.
—— *capensis*, Sars.
—— *rigidus*, Sars.

To complete the group the following may be added :—

Diaptomus asiaticus, Ulj.
—— *masculus*, Brady.
—— *rehmanni*, Grochm.

If we take a member of this group—e. g., *D. chevreuxi*—and compare it with *Paradiaptomus* and typical *Diaptomus*, we get the following agreements and differences:—

	Paradiaptomus.	*D. chevreuxi.*	*Diaptomus.*
Abdomen, female.	Two somites.	Four.	Three.
Furcal rami, male.	Asymmetrical.	Symmetrical.	Symmetrical.
Furcal rami, female	Tendency to asymmetry.	Slightly asymmetrical.	Symmetrical.
Maxillipedes	Last two joints much reduced.	Not reduced.	Not reduced.
Leg 1, exopod 3 ..	Two outer spines.	Two spines.	One spine.
Leg 2, endopod 2 ..	Without posterior lappet.	With lappet.	With lappet.
Prehensile antennule, last joint.	With process.	With process.	Generally without process.

While the peculiarly modified terminal part of the male fifth leg is characteristic of these "*Paradiaptomus*" forms, the difference between them and typical *Diaptomus*, even in extreme cases, cannot easily be defined. In *D. chevreuxi*, while the general form of the appendages in both sexes is clearly of the *Paradiaptomus* form, there is no fundamental difference between them and those of *Diaptomus*. Extreme broadening of the 2nd basal joint of the right leg is generally a character of *Paradiaptomus*, and is found in *D. chevreuxi*, but it is by no means universal. It is, in fact, impossible to do more than to say of these forms that the fifth leg of the male (left) is "much modified" as compared with that of *Diaptomus*.

I give in fig. III. rough copies of illustrations of the last joints of the left leg in a number of species, to illustrate the easy transition from *Diaptomus* to *Paradiaptomus*. These examples suffice to show that it is not possible to separate the *alluaudi*-group of *Diaptomus* from *Paradiaptomus* on the structure of the fifth leg. The resemblance in the case of *D. alluaudi* to *P. falcifer* is most striking.

In the fifth leg of the female there is also no essential difference. The outer spine of joint 2 of the exopod is larger in *Paradiaptomus* than is usually the case in *Diaptomus*, and the third joint takes the form of a spine; but in *Diaptomus* this joint may be very much reduced, and there is no definable difference.

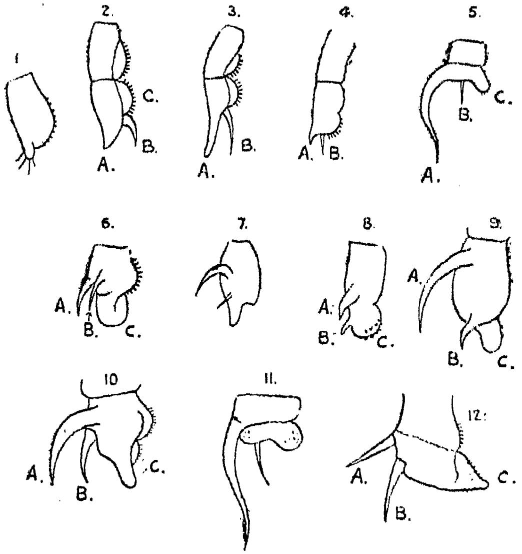
There are actually only two characters in which *D. chevreuxi* differs from typical *Diaptomus* and approaches

Paradiaptomus, apart from the modification of the male leg 5 :—

(1) Tendency to asymmetry in the furcal rami.
(2) Presence of two spines on exopod 3 of leg 1.

The asymmetry of the furca is, however, scarcely traceable in the male, in which it is most marked in

Fig. III.



Leg 5 of male, terminal joints on left side.

1. *Diaptomus schubotzi*, Van Douwe (inner spine B lost).
2. —— *castor*, Jur.
3. —— *salinus*, Dad.
4. —— *amblyodon*, Marenz.
5. *Paradiaptomus falcifer* (Lovén).
6. *Diaptomus asiaticus*, Ulj.
7. —— *purcelli*, Sars.
8. —— *colonialis*, Van Douwe.
9. *Metadiaptomus natalensis*, Methuen.
10. *Diaptomus æthiopicus*, Dad.
11. —— *alluaudi*, G. & R.
12. *Paradiaptomus lamellatus*, Sars.

A. terminal process. B. Inner spine. C. Inner pad of joint 2.

Paradiaptomus. The character on which most stress has been laid in separating *Paradiaptomus* from *Diaptomus*, namely, the two-jointed abdomen of the female, would definitely exclude *D. chevreuxi*, since here there are four somites—actually one more than in *Diaptomus.* In the structure of the maxillipedes *D. chevreuxi* is certainly a *Diaptomus.*

It is worth while to tabulate such information as is available regarding the other species allied to *D. chevreuxi* to see if they bear out this conclusion. Of these species I have only examined myself *D. asiaticus, D. chevreuxi,* and *D. alluaudi,* the specimens of the two latter coming from Merg in Cyrenaica.

In the table I have used the symbols D or P to indicate whether in respect of any character the species most resembles *Paradiaptomus* or *Diaptomus,* thus :—

	Diaptomus.	*Paradiaptomus.*
Abdomen of female	Three somites.	Two.
Furcal rami of male	Symmetrical.	Asymmetrical.
Leg 1, spines on R.E. 3..	One.	Two.
Leg 2, R.I. 2	With lappet.	Without.
Preh. antenna, terminal hook	Absent.	Present.

The presence or absence of a terminal process on the prehensile antenna is, of course, not distinctive of *Paradiaptomus,* but it is very rare in typical *Diaptomus*—e. g., *D. denticornis, D. pacificus.*

The table on p. 580 shows regrettable lack of information, but reveals a complete mingling of characters.

Adiaptomus natalensis, Diaptomus bouvieri, and *D. africanus* alone have the *Paradiaptomus* character in the maxillipede, and the first two are, in other respects, clearly members of that genus, but in neither case are the furcal rami symmetrical. *D. africanus* is a species of very doubtful position. It apparently has an abdomen of typical *Diaptomus* form and symmetrical rami ; but would otherwise be referred to *Paradiaptomus.* Daday's figure of the maxillipede is probably incorrect, but indicates a limb of *Paradiaptomus* form. The species, in fact, bridges the gap between the two genera.

All these forms agree, so far as is known, in having two spines on leg 1, and in having some form of terminal process on the prehensile antenna ; but if, for these reasons, we include them in *Paradiaptomus* we must abandon the two chief characters upon which the genus was founded (the two-jointed abdomen and contracted maxillipede), and separation from *Diaptomus* would rest only on the presence or absence of two spines on leg 1.

It seems to me better to recognise that we have here an unbroken evolutionary series uniting the two genera, but to retain them as distinct, basing the distinction on the number of somites in the female abdomen and the structure of the maxillipede. The group of anomalous *Diaptomus* with which we have been dealing might also be separated from *Diaptomus* as a subgenus on the single character of the first leg, combined with the modification of the fifth leg of the male.

	Abdomen of female.	Furcal rami of male.	Prehensile antenna.	Maxillipede.	Leg 1.	Leg 2.	Leg 5, female.	Leg 5, male.
Adiaptomus natalensis	P	D	?	P	P	?	P	P
Metadiaptomus transvaalensis	D	D	?	D	P	?	P	P
Diaptomus æthiopicus	D	P	P	?	?	?	P	P
D. africanus	D	D	P	P	?	?	P	P
D. alluaudi	D	P	P	D	P	P	P	P
D. bouvieri...............	?	D	P	P	P	?	P	P
D. capensis	D	D	P	D	P	?	P	P
D. chevreuxi	D	D	P	D	P	D	P	P
D. colonialis	D	D	P	D	?	?	D	P
D. meridianus	D	D	P	D	P	?	D	P
D. masculus	D	?	P	?	?	?	D	P
D. purcelli................	D	P	P	D	?	?	P	P
D. rehmanni	D	D	P	?	?	?	P	P
D. rigidus	D	?	?	D	?	?	P	P
D. asiaticus	D	P	P	D	P	D	D	P

This subgenus, or genus if it is more convenient to regard it as distinct, would then take Methuen's name *Metadiaptomus* with *M. transvaalensis* as the type.

The following list gives the distribution of the species to be included in it :—

æthiopicus, Daday. East Africa.
asiaticus, Ulj. Central Asia, Turkestan, China, S.E. Russia.
alluaudi, DeG. & Rich. Spain, Portugal, Balkans, Galicia, Hungary, Canaries, Cyrenaica, Egypt.
capensis, Sars. Cape Town.
chevreuxi, DeG. & Rich. Algeria, Cyrenaica, Mesopotamia.
colonialis, Van Douwe. S.W. Africa, Transvaal.
masculus, Brady. Orange Free State (Harrismith).
meridianus, Van Douwe. S. Africa (Kalahari).
purcelli, Sars. Cape Town.
rigidus, Sars. Orange Free State (Kimberley).
rehmanni, Grochm. E. Africa (Ussangu steppe).
tibetanus, Daday. Thibet.
transvaalensis, Methuen. Transvaal.

The group is, for the most part, confined to South Africa, but extends to East Africa and to Asia. Only two, however, *D. asiaticus* and *D. tibetanus*, are confined to Asia. It is, therefore, geographically, as well as structurally, a homogeneous group.

If these conclusions are accepted, the South African Diaptomidæ discussed will be named as follows :—

DIAPTOMUS, Westwood.

Abdomen of female of 3 (or 4) somites *. Furcal rami generally symmetrical in both sexes. Exopod of antenna longer than endopod. Maxillipedes slender, the five terminal joints well developed. Exopod of leg 1 with one outer spine on joint 3. Leg 2 with cuticular lobe on posterior face of joint 2 of endopod. Leg 5 of female usually with joint 3 of exopod well defined.

PARADIAPTOMUS, Sars, 1895.

Abdomen of female of two somites *. Furcal rami of male usually more or less asymmetrical. Prehensile antennule of male with finger- or hook-like process on last joint. Exopod of antenna sometimes shorter than endopod. Maxillipede with terminal two joints reduced, the whole appendage very stout. Leg 1 with two outer spines on R.E. 3.

* To each of these definitions there is an exception. In the case of *Diaptomus*, *D. incrassatus*, Sars, has two somites; while in *P. similis*, Van Douwe, there are three.

Leg 2 without cuticular lobe. Leg 5 of female with joint 3 represented by a movable spine. Outer spine of joint 2 strong. Left leg 5 of male very much modified in adult.

Syn. *Broteas*, Lovén, 1845.
Lovenula, Schmeil, 1898.
Lovenula } Sars, 1927.
Paradiaptomus }

Lovenula *series*.

1. *Paradiaptomus falcifer* (Lovén).

Syn. *Broteas falcifer*, Sars, 1899.
Lovenula mea, Gurney, 1905.
Paradiaptomus falcifer, Rühe, 1914.
Paradiaptomus falcifer, Van Douwe, 1912.
Adiaptomus natalensis, Cooper, 1906.
Diaptomus bouvieri, Daday, 1910.
Lovenula simplex, Kiefer, 1929.

Van Douwe (1912) first suggested that the species described by Sars under this name is really a distinct species, and this view is upheld by Kiefer (1929), who has given it a new name. Rühe, on the other hand (1914), discussed this question and came to the conclusion that the two forms are identical. The position is by no means clear. Kiefer, who states that he has seen both forms, gives no assistance in separating them. Figures of "*L. falcifera*" have been published by Lovén, Sars, Brady, Methuen, Daday (*D. bouvieri*), Van Douwe, and Rühe. The female abdomen may be symmetrical and undilated (*Sars*), asymmetrical and dilated (*Rühe*, *Van Douwe*), with symmetrical lateral processes (*Lovén*, *Brady*, *Methuen*). The outer setæ of the right furcal ramus in the male may be unmodified (*Lovén*, *Methuen*, *Daday*, *Van Douwe*) or modified (*Sars*, *Rühe*). Finally, the left leg 5 of the male may have the inner pad pointing inwards, giving a sort of semilunar distal margin (*Brady*, *Daday*, *Van Douwe*) or pointing forwards parallel to the outer spine (*Lovén*, *Sars*, *Rühe*). These three characters, then, which alone can be used in separating the species, overlap, so that the only possible conclusion seems to be that there is but one variable species.

2. *Paradiaptomus natalensis* (Cooper).

Syn. *Diaptomus pictus*, Brady, 1913.

3. *Paradiaptomus barnardi*, Sars.

4. *Paradiaptomus excellens*, Kiefer.

Paradiaptomus *series.*

5. *Paradiaptomus lamellatus*, Sars.
6. *Paradiaptomus schultzei*, Van Douwe.
7. *Paradiaptomus similis*, Van Douwe.
8. *Paradiaptomus stolzmanni* (Grochmalicki).

METADIAPTOMUS, Methuen, 1910.

Abdomen of female of three somites (four in *M. chevreuxi*). Furcal rami of male generally more or less asymmetrical. Prehensile antennule of male with finger or hook-like process on last joint. Leg 1 with two outer spines on R.E. 3. Leg 2 with or without cuticular lobe. Leg 5 as in *Paradiaptomus*.

See list of species on p. 581.

Judging from the few species which I have been able to examine, the antennule of *Paradiaptomus* and *Metadiaptomus* is characterised by the reduced number of setæ. Joint 9 has two setæ, and joint 11 has two in *P. similis* and *M. chevreuxi*, but only one in *M. asiaticus* and *M. alluaudi*. Joints 13 to 19 have one only. The arrangement of æsthetes is the same as in *Diaptomus*.

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LXX.—*Descriptions and Records of Bees.*—CXX.

By T. D. A. COCKERELL, University of Colorado.

Halictus (*Seladonia*) *daturæ*, sp. n.

♀.—Length 6 mm. or a little over.

Rather dark green, with dull white pubescence; antennæ dark, the flagellum obscurely reddish beneath; mandibles black; clypeus with the lower margin broadly black; mesothorax very densely punctured, but glistening between the punctures; area of metathorax large, the basal part dull and roughened with fine sculpture, the apical part broadly shining; tegulæ rufous. Wings clear hyaline, stigma and nervures very pale testaceous; second cubital cell high and narrow, receiving recurrent nervure some distance before end. Legs black, with the knees and small joints of tarsi more or less rufescent. Abdomen green, finely punctured, apical hair-bands narrow, first tergite without lateral patches, basal bands thin and not very broad.

Nan, Siam (*Cockerell*). First found Dec. 28, 1927, abundant at flowers of *Datura*, close to the Nan river; later taken frequently during the first half of January, and observed to visit Compositæ. The last was taken Jan. 14 (*W. P. Cockerell*).

When collecting it I thought I had *H. propinquus*, Smith, but it differs from that by the front legs without red, scutellum duller, and area of metathorax a little different. It does not agree any better with other Indian species.

By the dark legs it resembles the Palæarctic *H. tumulorum*, L., and it has quite the same sort of hind spur, *i. e.*, with about five oblique rounded teeth, rapidly decreasing apicad. Compared with *H. tumulorum* it is brighter green, fourth antennal joint is shorter, and the area of metathorax is different, presenting delicate, vermiform, anastomosing rugæ. In *H. tumulorum* the area is longer, with very delicate nearly straight plicæ, and fine cross ones between. In some ways *H. perkinsi*, Blüthg., is more like the Nan species, but the thorax is broader and yellowish green. There is one unusually large and robust specimen of *H. daturæ*, taken Jan. 7, which comes very close to *H. perkinsi* in build, but has the face bluer green and the abdomen entirely green, with the semilunar area of metathorax rugulose practically all over, without the broad shining apical band. I call it *H. daturæ*, var. *laosina*, nov., but it may possibly be a distinct species. The area is not squared off behind as in *H. perkinsi*.

It seems curious to find a species of Holarctic type in the Tropics ; but *Seladonia* extends far southward, being represented even in S. Africa by the relatively large *H. jucundus*,

Halictus (*Seladonia*) *speculiferus*, sp. n.

♀.—Length about 5 mm.

Similar to the last, but smaller, dark bluish green ; hind margins of abdominal segments narrowly reddened. I thought this might be a small peculiarly coloured individual of *H. daturæ*, but, on using the microscope, good specific characters are apparent. The hind spur is of the same type. The area of metathorax has a very short basal region, with fine vermiform rugæ, followed by a smooth shining band, which is bounded by the well-defined edge. The posterior truncation of thorax is brilliantly shining, whence the specific name. There is a region below each lateral ocellus where the punctures are widely spaced on a shining ground, and there are only excessively minute punctures along the inner orbits. In *H. daturæ* the front is strongly punctured all over. The orbits rather strongly converge below, which is not true of *H. daturæ*.

Nan, Siam, Jan. 8, 1928 (*Cockerell*).

Halictus (*Chloralictus*) *vernalis*, Smith *.

In his discussion of the Oriental species of the *Seladonia* group, Blüthgen (1926) included *H. vernalis*, remarking that he had never seen it. I examined the type, and it belongs to a different subgenus. It has a dark reddish-piceous (nonmetallic) abdomen, with no bands on the apical margins of the tergites; the mesothorax is shining brassy green. It is from Ceylon.

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* *Halictus vernalis* (Jörg., 1912), from Mendoza, Argentina, may take the name *H. ultimus*, n. n.

Halictus (*Seladonia*) *ferripennis*, sp. n.

♀.—Length about 6 mm.

Head and thorax very dark bluish green, abdomen black; clypeus black, supraclypeal area with a coppery tint; mandibles black; face broad; flagellum ferruginous beneath except at base; third antennal joint much longer than broad, about as long as second, fourth short, much broader than long, fifth a little longer than fourth but also broader than long; front with dense strong punctures right up to orbits; mesothorax somewhat shining, very dark, with stong punctures in rows; scutellum dullish and closely punctured; area of metathorax large, dull, finely sculptured, poorly defined, with no shining rim; the microscope shows the area to have strong wrinkled rugæ, presenting little pointed projections at intervals, and the apical part to have fine transverse striæ; mesopleura dull; hair of head and thorax scanty, greyish; tegulæ basally black, but with a large rufous spot. Wings strongly reddened, stigma very light reddish, nervures very pale. Legs black, with small joints of tarsi ferruginous; spurs pale ferruginous. Abdomen moderately shining, apical hair-bands very weak and thin, hardly developed on first two tergites; basal bands also weak and thin, so that the abdomen appears only faintly banded. The outer nervures are strong as in *Seladonia,* not weak as in *Chloralictus.*

Smolenschina (near Irkutsk), Siberia, Aug. 21, 1927 (*W. P. Cockerell*). A second specimen, which I collected at the same place on the same day, differs by having the mesothorax greener, with rather strong coppery suffusion on the disc.

This is easily known from *H. tumulorum* by the flagellum clear red beneath, the reddened wings, and the area of metathorax with coarser angular or zigzag rugæ, and apical transverse striæ. By the reddened wings it recalls *H. kessleri,* Brams., but that is less robust, with lighter tegulæ and different area of metathorax. In *H. kessleri* the metathorax presents a very short rugose area (with extremely fine plicæ), forming a curved band, and a broad shining space beyond, the surface of which is microscopically tessellate.

The postscutellum is not evidently tomentose as it is in *H. tumulorum.*

Halictus aliciellus, sp. n.

♀.—Length 5 mm.

Head and thorox black, the thorax small, not robust; mandibles black; antennæ black, the apical two-thirds of flagellum red beneath; tegulæ refo-testaceous. Wings hyaline, slightly greyish, stigma and nervures pale dull testaceous; second cubital cell narrowed above. Legs black. Hair of head and thorax dull white, postscutellum densely-white-tomentose. Abdomen shining bright orange-ferruginous, without any dark markings, and without bands. Head broad, but orbits converging below; fourth antennal joint very short, hardly over half length of third; front closely and minutely punctured; mesothorax moderately shining, with very fine distinctly separated punctures; area of metathorax large, dull basally, shining apically, in the middle with very fine irregular rugæ, but at sides with a few well-defined complete straight plicæ; posterior truncation of metathorax covered with appressed finely plumose hairs, and with a few outstanding long ones; hind spur with three very long spines.

Nan, Siam, 1927, first taken by Miss Alice Mackie, Jan. 13; later I took specimens on Jan. 21 and 30.

Among the species tabulated by Blüthgen it comes nearest to *H. massuricus*, Blüthg., but differs by the entirely clear red abdomen and other features. It is a peculiar and isolated species.

Halictus quadricinctus (Fabr.).

3 ♀, Smolenschina, Siberia, Aug. 21 (*Cockerell*, *W. P. Cockerell*); 1 ♂, Kychtak, Siberia, Aug. 20 (*W. P. Cockerell*).

The male is peculiar in having the area of metathorax with distinct radiating striæ, as in some examples of the related *H. tomentosus*, Ev., but it is otherwise exactly *H. quadricinctus*. These insects are not the variety *ægyptiacus*, Friese, which is reported to occur in northern Asia.

Halictus rubicundus (Christ.).

5 ♀, Ust Balei, Siberia, July (*Cockerell*).

Blüthgen has recorded it from Irkutsk.

Halictus tomentosus, Eversm.

10 ♀ from Siberia; 6 from Smolenschina, 2 from Archan, 2 from Ust Balei (*Cockerell*); also 3 ♂, 2 Smolenschina, 1 Kychtak (*Cockerell*).

This is *H. tetrazonius*, Klug, as determined by Friese, and as previously understood by me. Blüthgen states that he found Klug's type (from Dalmatia) in the Berlin Museum, and it is a distinct species. The Siberian males are in agreement with *H. tomentosus*, not *H. simplex*, Blüthg.

Halictus calceatus ulterior, subsp. n.

♂ (type).—Area of metathorax more pointed behind, with much finer and more numerous plicæ; hind margins of tergites very narrowly reddened, the first not at all.

♀.—Hind margins of tergites hardly reddened.

Type (♂) from Smolenschina, Siberia, Aug. 21 (*Cockerell*). Females from Siberia: Tibeltye, August (*W. P. Cockerell*); Okeanskaja, August (*Cockerell*).

I should not have separated this on the female, but the male is quite distinctive.

I took two males of quite typical *H. calceatus*, Scopoli, at flowers of *Thymus*, at Ust Katav, in the foot-hills of the Urals, August 27. This is in Europe.

Halictus (*Chloralictus*) *trincomalicus*, Cam.

Blüthgen remarked that he did not know this species, and did not know where to put it. I examined the type, and found the outer intercubitus and recurrent much weakened, as in *Chloralictus*. Stigma reddish sepia; head rather long; mesothorax highly polished; abdomen blue-green, with hind margins of tergites piceous.

Halictus (*Seladonia*) *umbrosus*, sp. n.

♀.—Length about 7 mm., anterior wing 5·8.

Very robust, with very broad abdomen and large head with broad rounded cheeks; dark olive-green, the abdomen (except base of first tergite, which is shining yellowish green) blackened, with green suffusion, especially on the hind margins of the tergites; the black on the disc of the second tergite is slightly purplish; mandibles and antennæ black; clypeus black except upper edge; supraclypeal area slightly brassy; facial quadrangle about as broad as long; front dull and very densely punctured, a shining spot in front of anterior ocellus; hair of head and thorax dull white, very scanty; mesothorax and scutellum finely and closely punctured, but shining; area of metathorax semilunar, with fine, dense, somewhat wrinkled plicæ, the hind margin rounded and highly polished; tegulæ dark rufous, mainly black anteriorly. Wings dilute reddish, stigma and nervures pale reddish; second cubital cell broad, nearly square; outer nervures strong. Legs black, with pale fulvous-tinted hair; hind spur with a series of nodular teeth, differing from the type of *H. tumulorum* in that the teeth are practically erect, not oblique, and at either end of the series very minute, about the third being the only large one, which is broadly rounded at end. Abdomen shining, very finely punctured; no patches at sides of first tergite, but a little hoary pubescence; apical bands practically obsolete, but narrow greyish-white basal bands on segments 2 to 4; venter black.

Nan, Siam, Jan. 7 (*Cockerell*).

Very close to *H. grandiceps*, Cam. (specimen from Simla compared), but smaller, with bands on abdomen less developed, mesothorax bluer green, and head not so massive. The hind spur of *H. grandiceps* has the teeth strongly oblique.

HALICTUS, subgen. PACHYHALICTUS, nov.

Type, *H. merescens* (Ckll.).

This name is proposed for the Halicti Nomiiformes of Vachal and Blüthgen, characterized by the stout form of the females, with peculiar sculpture, and the males with short antennæ. Blüthgen (Zool. Jahrb. 1926) has given a very full account of the group. Bingham, in his table, indicates that two species have a carina on the clypeus; this is a slip—the carina is on the front, as the descriptions show.

Halictus (*Pachyhalictus*) *liodomus*, Vachal.

♀.—Nan, Siam, Jan. 14 (*W. P. Cockerell*).

This agrees with Vachal's description, but some doubt was introduced by Bingham's statement that there is no frontal keel. Blüthgen, however, describes a frontal keel as extending halfway up, and this agrees with my specimen. The hind spur has very long somewhat curved spines.

Halictus (*Pachyhalictus*) *reticulosus*, D.T.

6 ♀, Siam, Nan, Dec. 31, Jan. 14 and 31 (*Cockerell*), Jan. 1 (*M. Collier* and *W. P. Cockerell*). Near Weing Sa, Dec. 25, on bamboo foliage (*Cockerell*). Mekami River, Feb. (*Cockerell*).

This agrees with the characters in Blüthgen's key, and my notes on a specimen I saw in the F.M.S. Museum. Vachal says the hind spur has three spines; I find six.

Trigona atomella, Cockerell.

Pahtoop Mt., Siam, Jan. 11 (*Cockerell*); Nan, Siam, found clinging to the leg of a large green cicada (*Platylomia spiculata*, Nouh.), Jan. 27 (*Mary Collier*). Described from Penang.

Trigona scintillans, Cockerell.

Described from Borneo, but now found to be present in northern Siam, where they were a great nuisance in camp, settling on one's hands and face. Pah Meeung Mt., Jan. 17 and 18 (*Cockerell*; *Alice Mackie*); Pahtoop Mt., Jan. 11 (*Cockerell*).

It is a very small species, about 3 mm. long.

One specimen was taken at Angkor, Cambodia, Feb. 20 (*W. P. Cockerell*).

Trigona iridipennis, Smith.

Rangoon, Burma, common at flowers of *Helianthus annuus*, Dec. 15 (*Cockerell*); Bangkok, Siam, Feb. 19 (*Cockerell*). The following mostly have the flagellum darker, but are not otherwise separable:—Cambodia: Angkor, Feb. 21 (*Cockerell*). Siam: Nan, Jan. 8 (*Cockerell*), and Jan. 14 (*Alice Mackie*); Pahtoop Mt., Jan. 11 (*Cockerell*); Kum Puang Creek, Jan. 26 (*Cockerell*).

This is the very common species which I have frequently referred to *T. læviceps*, Smith, since it has a polished vertex and goes exactly to that species in Bingham's table. However, it has black legs with only the small joints of the tarsi red, and I have specimens from Ceylon (*Green*), whence *T. iridipennis* was described, and where *T. læviceps* is not known to occur. The character in Bingham's table is wrong; in his description he says the head is smooth and shining. I also have the species from Salem and Mangalore (S. Canara), India (*Dutt*), and from Bombay, the latter determined as *T. iridipennis* by Col. Nurse. McGregor collected it at Puerto Princesa, Palawan, Philippine Is.

The original *T. læviceps*, Sm., came from Singapore, and was very small (worker 1·5 lines), the abdomen ferruginous, smooth, and shining. In the Wilson Saunders collection a different species from the Aru Islands is labelled "*T. læviceps*." Bingham's *T. læviceps*, from Tenasserim, said to have rufo-testaceous legs and to average larger than *T. iridipennis*, must also be something different. In the U.S. National Museum I examined a species labelled "*T. læviceps*," collected by Fea. It has the antennæ fulvous, mesothorax polished, abdomen clear red without marks. This seems to be identical with the original insect of Smith.

Trigona hemileuca, Cockerell.

West of Weing Sa, Siam, Feb. (*Cockerell*).

Trigona cambodiensis, Cockerell.

Siam, Pah Meeung Mt., Jan. 18 (*Cockerell*) ; Ban Maa Hia, Feb. 11 (*Alice Mackie*).

Trigona fulvomarginata, Cockerell.

This was described from Penang as being closely allied to *T. ventralis*, Smith, but differing by the dusky wings and bright fulvous hair bordering mesothorax and scutellum. The coxæ, trochanters, and middle femora basally are light ferruginous. The hair fringing posterior tibiæ behind is long and black, and the hair on inner side of hind basitarsi is dark. Bingham says the wings of *T. ventralis* are "hyaline and iridescent," but I examined the type in the Wilson Saunders collection and found them dusky. As to the fulvous hair, it can be matched in specimens from Angkor, Cambodia, and Pahtoop Mt., Siam; but in my long series of over forty specimens from Siam I cannot draw any distinct line between those with fulvous hair on thorax and those (more common) in which it is greyish white. Nevertheless, *T. fulvomarginata* is not the true *T. ventralis* (said to come from Sarawak and Mt. Ophir ; the first-mentioned locality must be held typical), as that is smaller, the fringe on hind tibiæ pale, and the hair on inner side of basitarsi golden. The closely allied *T. javanica*, Gribodo, from Java, agrees with *T. fulvomarginata* in having the apical margin of the clypeus, the labrum, and mandibles flavo-ochraceous, and in the bimaculate first tergite, but differs at once by the rufous legs.

There remains *T. terminata*, Smith (Tenasserim), which Bingham thought to be a large form of *T. ventralis*. I did not find it at Oxford or in the British Museum, and can only surmise that it may prove to be the prior name for *T. fulvomarginata*. I certainly cannot affirm this, and so hold to the name which is surely applicable.

My material is from the following localities :—Cambodia : Angkor, Feb. 20 (*Cockerell, W. P. Cockerell*). Siam : Pahtoop Mt., Jan. 11 (*Cockerell*); Pah Meeung Mt., Jan. 18 (*Cockerell*); near Nam Geeung, Jan. 25 (*Cockerell*); Nan, January, very abundant (*Cockerell, Alice Mackie*).

Trigona arcifera, sp. n.

Like *T. ventralis*, Sm. ; small, length about 5 mm.

Wings clear and iridescent; first tergite creamy white, with a semicircular (convex apicad) transverse dark brown band; apex broadly creamy white. Venter the same, with a pair of very large brown subbasal spots, and a large elongate brown patch at each side. Basal portions of legs black. Clypeus not distinctly light-margined, though there is a faint pallid line just before the apex. The hair fringing hind tibiæ posteriorly and on inner side of basitarsi is dark brown.

Testa Bridge, Himalayas, India, 10. 1. 97 (*Sladen*). Sent as *T. ventralis*.

Trigona valdezi, Cockerell.

I refer here a long series of specimens from Siam and Cambodia. The species is very much like *T. iridipennis*, but larger, with the hind trochanters clear red, abruptly contrasting with the black femora. The tegulæ vary from ferruginous to practically black. The abdomen also varies to nearly black. So far as my notes show, the Aru supposed *T. læviceps* might be *valdezi*. *T. valdezi* was described from Singapore.

Cambodia: Angkor, Feb. 21 (*Cockerell, W. P. Cockerell*). Siam: Pah Meeung Mt., Jan. 18 (*W. P. Cockerell, Alice Mackie*); Nan, Dec. 28 to Jan. 14 (*Cockerell, Alice Mackie*). At Nan they occurred on flowers of *Poinsettia*.

These northern specimens never have the tegulæ so light as in the type.

Trigona flavibasis, sp. n.

Worker.—Length about 5 mm.

Robust and compact; head and thorax dull black, the metathorax shining; thin pale brown pubescence on head and thorax above; face and sides of thorax with thin dull white hair; mandibles black; region on each side of antennæ distinctly shining; front and mesothorax with excessively minute dense sculpture; upper face of metathorax polished; tegulæ black. Wings dilute brownish, stigma and nervures brown; the large stigma uniform brown, not dark-margined. Legs black, with red hair on inner side of tarsi; tarsi rather obscurely rufous apically; hair on hind margin of hind tibiæ black. Abdomen short and broad, shining black; a large clear yellow patch at each side of base of first tergite, and a subtriangular spot of the same at each extreme side above; apical tergite brownish; ventral segments with narrow fringes of silvery-white hair.

Doi Sutep, Siam, Feb. 9 (*Alice Mackie*).

A very distinct species, easily known by the dull head and thorax, and yellow marks on base of abdomen. The antennæ are black.

Apis florea andreniformis (Smith).

Mekami River, Siam, Feb. 2 (*Cockerell*).

Apis dorsata, Fabr.

Fetchpur Sikri (near Agra), India, Dec. 9 (*Cockerell*); Chiengmai, Siam (*McKean*).

Apis dorsata, var. *bicolor* (Klug).

Ban Maa Hia, Siam, Feb. 11 (*W. P. Cockerell*); Sandakan, Borneo (*Baker*).

This is described as having the first two tergites fulvous, the others black; but when the segments are extended it is seen that the bases of the others have dense fulvous bands, entirely hidden in contraction.

Apis indica peroni (Latr.).

Angkor, Cambodia, Feb. 20 (*W. P. Cockerell*); a specimen with the aspect of var. *nigrocincta*, Sm., but clypeus black. Doi Sutep, Siam (*W. P. Cockerell, McKean*); Puang Creek, Siam, Jan. 26 (*Cockerell*).

Spinoliella *and* Epimethea.

The bees of the arid parts of Asia present in many cases a very close resemblance to those of the arid regions of America. It is of great interest to inquire, are these resemblances due to real affinity or to "convergence" under similar conditions? Each case will have to be judged on its own merits. Recently, when describing a species of *Epimethea* from Usbekistan, I expressed the opinion that the American forms called *Spinoliella scitula* &c. were congeneric. The external features and the mouth-parts seemed to sufficiently demonstrate this. However, I sent some specimens of *Epimethea kuznetzovi* to Mr. P. H. Timberlake, and he has examined the genitalia and abdominal plates, reaching the conclusion that *Epimethea* is quite distinct from the American bees. "*Epimethea* has the genitalia of the general type of *Panurgus*, *Panurginus*, and *Pseudopanurgus*, whereas *Spinoliella* and *Calliopsis* have the genitalia quite different and agree closely with each other." He goes on to enumerate the characters in detail, but I do not cite them, hoping that he will publish a paper, with figures. I am fully satisfied that I was deceived as to the generic identity of the American bees with *Epimethea*, but the resemblance is astonishing.

LXXI.—*A new Cœcilian from S. Brazil.*

By H. W. PARKER and OTTO WETTSTEIN.

ATTEMPTS to determine a Cœcilian of unknown history, found in the collections of the Vienna Museum, have resulted in the discovery of eight more specimens of the same species in the same institution and yet another in the British Museum. The latter is one of two adult females, containing embryos, obtained by V. Frič, of Prague, at some time prior to 1907, from Santa Catharina, Brazil. These two specimens were identified at the time as *Siphonops brasiliensis*, Lütken, and the embryo was briefly described and figured by Vávra in the periodical 'Vesmír,' under that name; closer examination, however, reveals that the species is really a member of the genus *Chthonerpeton*, and is, apparently, undescribed; it may be known as

Chthonerpeton viviparum, sp. n.

Siphonops brasiliensis (non Lütken), Vávra, Vesmír, Prag, xxxvi. (1) 1907, p. 11, fig. 10.

Holotype.—A female, number 1907. 8. 28. 1 in the British Museum, from Santa Catharina, Brazil.

Skin without scales; eyes not under the cranial bones; two rows of mandibular teeth; squamosal and parietal not in contact.

Teeth small, the number on each bone being as follows:—premaxilla 6; maxilla 7; palato-pterygoid 10; mandible, outer row 12, inner row 3. Snout long, prominent, pointed, as long as the width of the head at the level of the eyes. Tentacle small, nearer the eye than the nostril, and a little below the straight line connecting these two; tentacular groove with a very small circular opening, but visible through the skin as a yellowish streak extending back to the orbit. Primary folds 144, none complete dorsally; no secondary folds. Uniformly greyish above; a little lighter beneath.

Length 335 mm.; greatest diameter 9 mm.; angle of mouth to tip of snout 8 mm.

Paratypes.—Eight adults and half-grown, numbers 29. 10. 9. 1–29. 10. 9. 8 in the Vienna Museum, from the environs of Joinville, Sta. Catharina; collected by Ehrhardt, 18th October, 1911.

One half-grown, number 29. 9. 26. 1 in the Vienna Museum; no history or data.

These nine specimens agree with the type in osteological characters and general proportions; none contain embryos. The teeth are as follows:—premaxilla and maxilla 12–13 a side; palato-pterygoid 9–10 a side; mandible, outer row 11–12, inner row 3–4 on each side. Body-folds 143–144 and 147–149 *. The largest specimens measure 404, 339, and 333 mm., with diameters of 8, 8, and 7·5 mm. respectively, and a head-length (from the angle of the mouth to the tip of the snout) of 8 mm.; a half-grown specimen (29. 9. 26. 1.) measures 170 mm. over all, with a diameter of 4·5 mm. and a head-length of 4 mm. Colour greyish-olive with a purplish tinge.

This new species is distinguished from the other members of the genus *Chthonerpeton* by its long prominent snout, the position of the tentacle closer to the eye than the nostril, and the appearance of the tentacular groove. In all these characters, however, it agrees well with the description of *Siphonops brasiliensis*, Lütken, and this suggested the possibility that the latter might have been referred to the wrong genus. This does not appear to be so, for a number of other specimens in the Viennese and British Museums agree still more closely with Lütken's description, and prove to be true *Siphonops*, lacking a second row of mandibular teeth and having the parietal and squamosal bones in contact. These specimens (4 from Joinville, 3 from Parnahyba near São Paulo and one without locality † in Vienna; and one from Sta. Catharina, in London) have only from 120–133 body-folds ‡, of which some of the anterior and posterior may be complete, and differ further from *C. viviparum* in having the snout slightly less prominent and higher, the eye less visible, and a much lower number of teeth in the upper jaw. The number of maxillary and premaxillary teeth on each side varies from 6 to 8 (*cf.* 12–13 in *viviparum*), and Prof. Jensen, who has very courteously re-examined the type of *S. brasiliensis* at our request, informs us that the total number of these teeth on the two sides is there 12, with possibly one or two additional small ones posteriorly, which have been lost. Consequently, it appears that in S. Brazil there are two species of cœcilians, superficially almost indistinguishable in the adult stage, but really of different ancestry, and probably characterized by totally different methods of reproduction.

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* Possibly a sexual difference, females having the lower count.

† It is interesting to note that this specimen has the whole head thrust into the puparium of a cycloraphous fly, the contents of the puparium being in the cœcilian's mouth.

‡ In the original description of *S. brasiliensis* the number of folds is given as 133; Nieden, in 'Das Tierreich,' xxxvii., Gymophiona, p. 25, gives this number in his key to the species, but in the actual description gives 146; possibly the specimen from which he took the latter figure is really referable to *Chthonerpeton viviparum*.

The breeding-habits of *S. brasiliensis* have not yet been recorded, but those of another species of the same genus (*S. annulatus*) are known through the observations of Goeldi *. The species is oviparous, the large eggs being laid on land, and the developing embryo having two pairs of large fimbriated gills. In *Chthonerpeton viviparum*, however, the eggs are retained within the oviducts. The embryo, instead of two pairs of fimbriated gills, has but a single pair of plate-like gills which are closely apposed to the inner walls of the oviducts, no trace of an egg-capsule being found. Vávra has described the gills as bilobed, and the figure suggests that they are really two pairs partially fused. Careful examination shows, however, that this appearance is due to the way in which the gill-plate is folded; each gill is, in reality, an oval plate lying parallel to the sagittal plane of the embryo, and connected to its neck by an exceedingly short peduncle which arises from the gill at a point rather dorsal and anterior to its geometric centre.

Length of embryo 62 mm.; diameter of body 2·5 mm.; length of gill-plate 14 mm.

Thus *Chthonerpeton viviparum* agrees in its method of reproduction and in the gill-structure of the embryo with the completely aquatic *Typhlonectes* † rather than with *Siphonops*, which (*S. paulensis*) is recorded as being an inhabitant of dry ground ‡. Consequently there is reason to suppose that, like its congener *C. indistinctum* §, it is subaquatic in habits, and this supposition receives some support from the fact that most of Ehrhardt's collections, made in 1911 from the neighbourhood of Joinville, were made on the lower part of the Itapocu River.

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* Zool. Jahrb., Syst. xii. 1899, pp. 170–173, pl. ix.

† Peters, Mon. Berlin Ak. 1875, p. 483, pls. i.–iii.

‡ v. Ihering, Rev. Mus. Paulista, viii. 1911, p. 92.

§ v. Ihering, *tom. cit.* p. 458.

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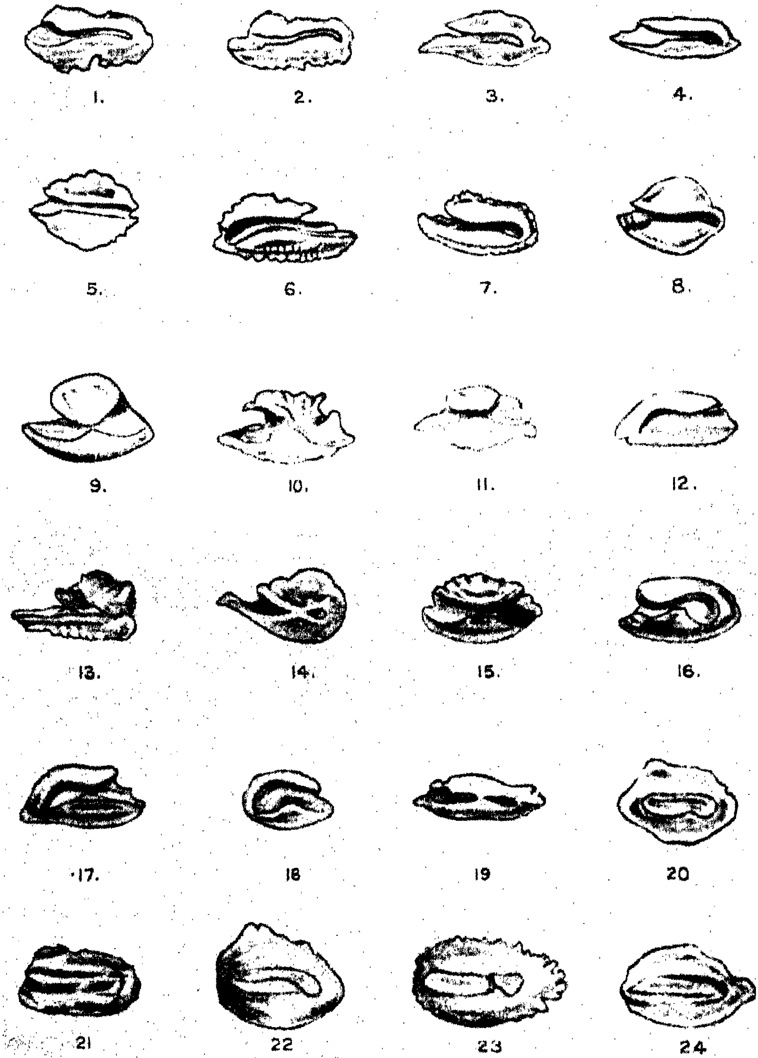

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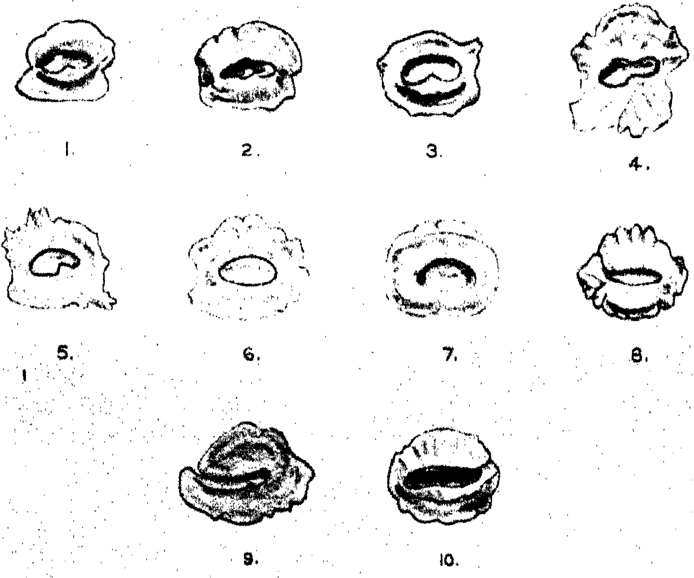

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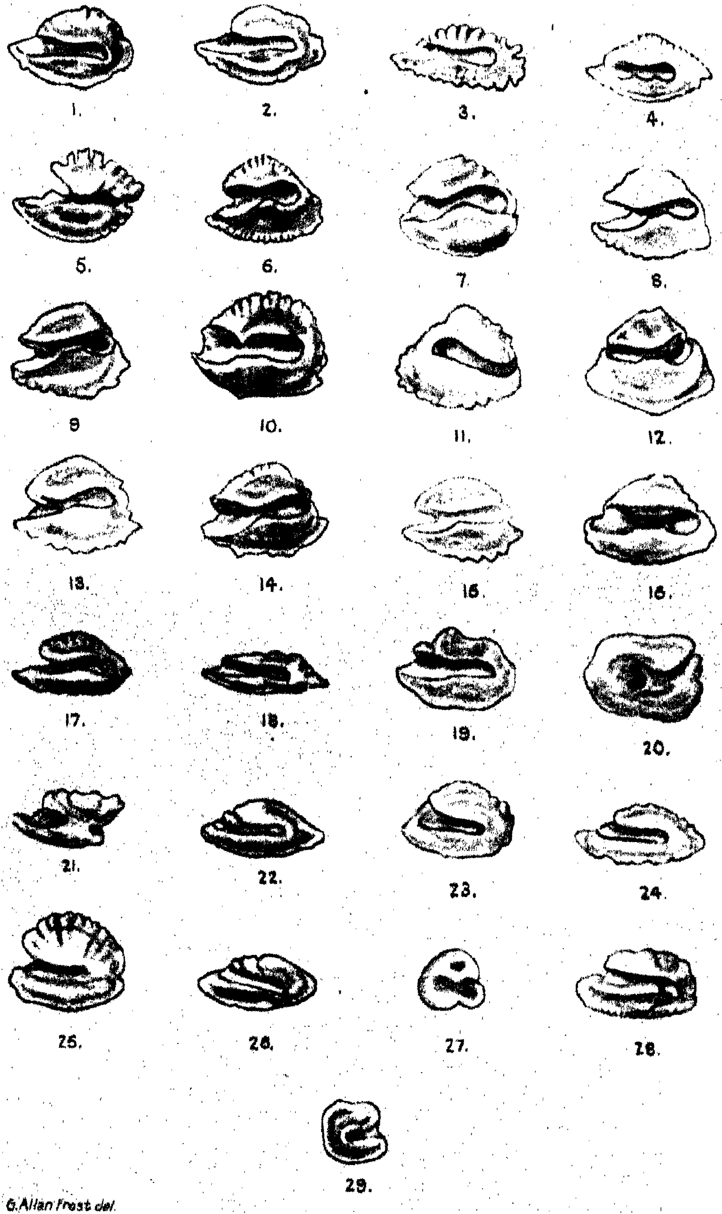

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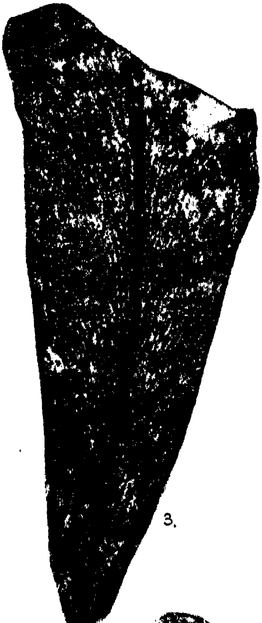

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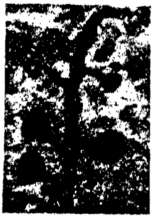

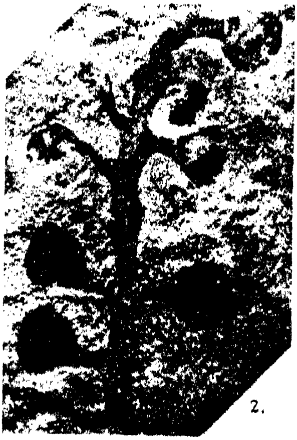

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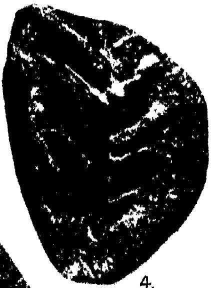

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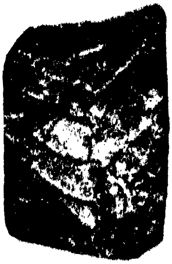

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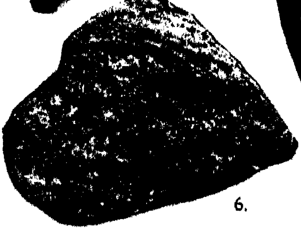

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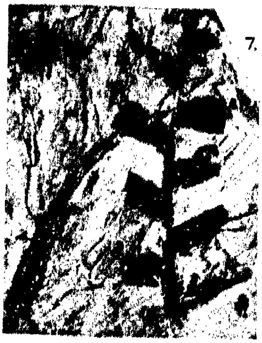

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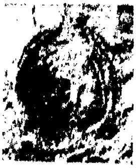

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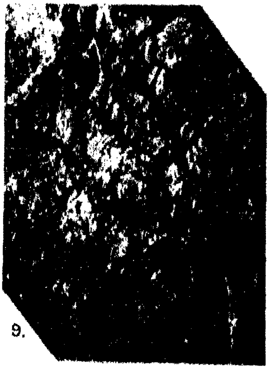

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SARDINIAN JURASSIC PLANTS.

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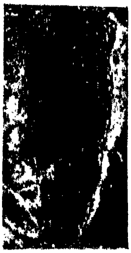

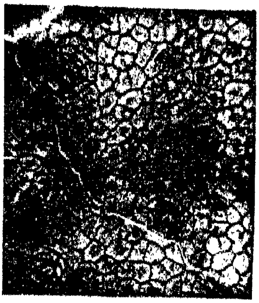

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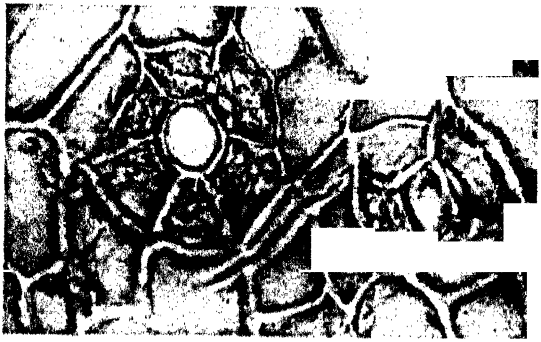

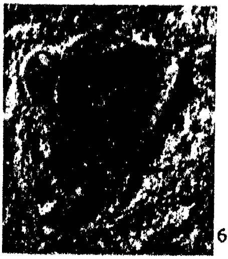

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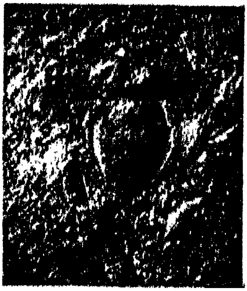

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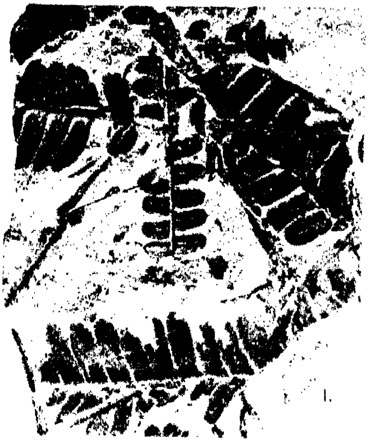

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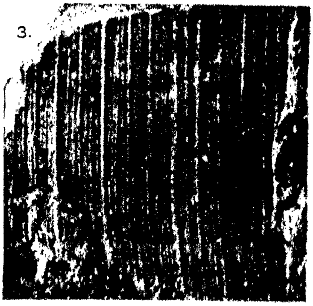

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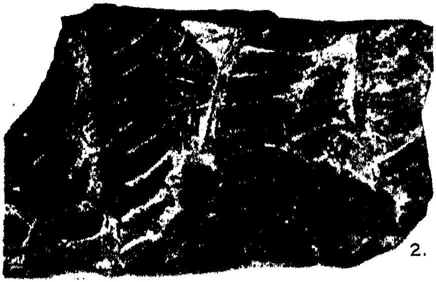

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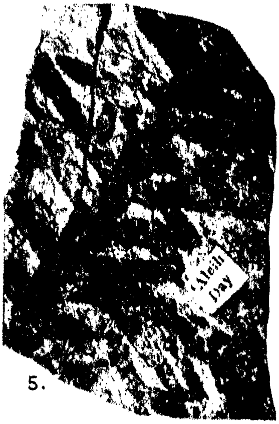

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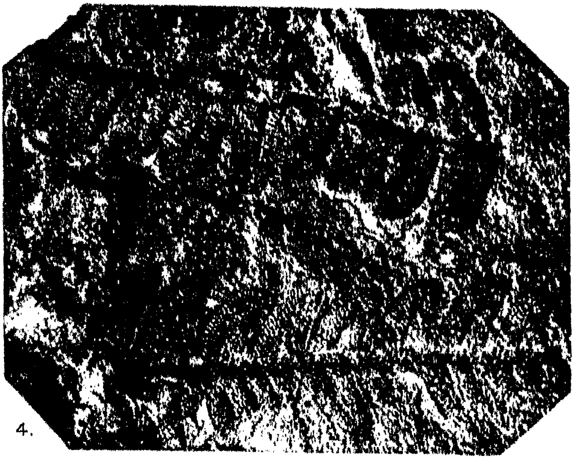

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CRETACEOUS PLANTS FROM SYRIA AND TRANSJORDANIA.

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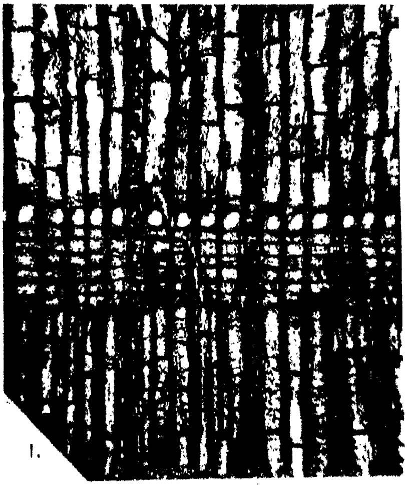

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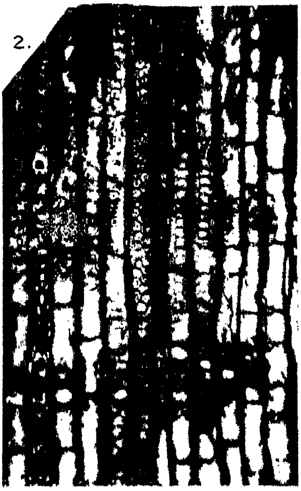

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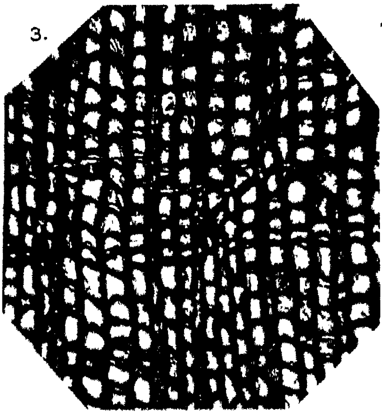

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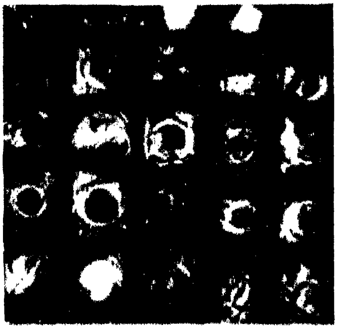

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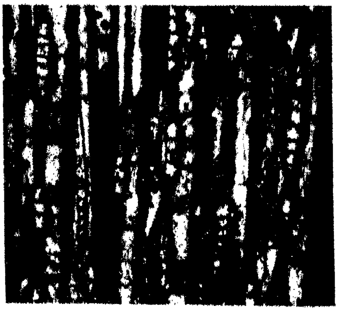

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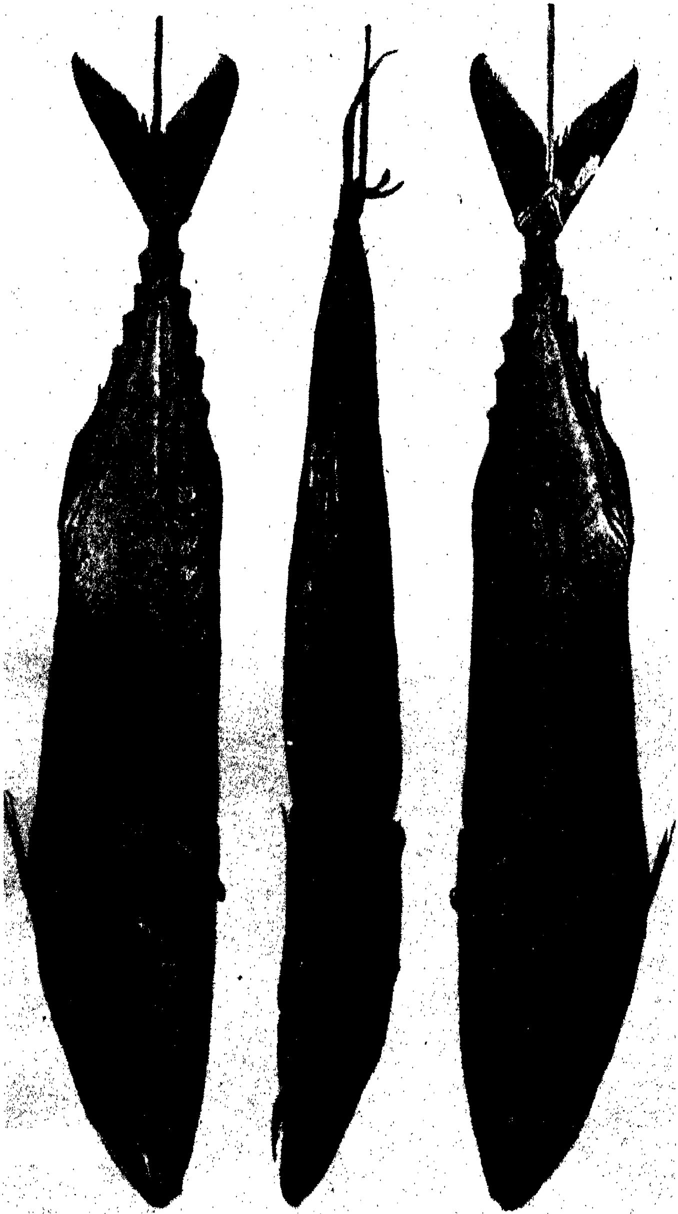

FIG. 1. FIG. 2. FIG. 3.

A MACKEREL (SCOMBER SCOMBRUS), WITH A RUBBER BAND ROVE THROUGH ITS BODY, SEEN FROM THE RIGHT SIDE (FIG. 1), FROM ABOVE (FIG. 2), AND FROM THE LEFT (FIG. 3).

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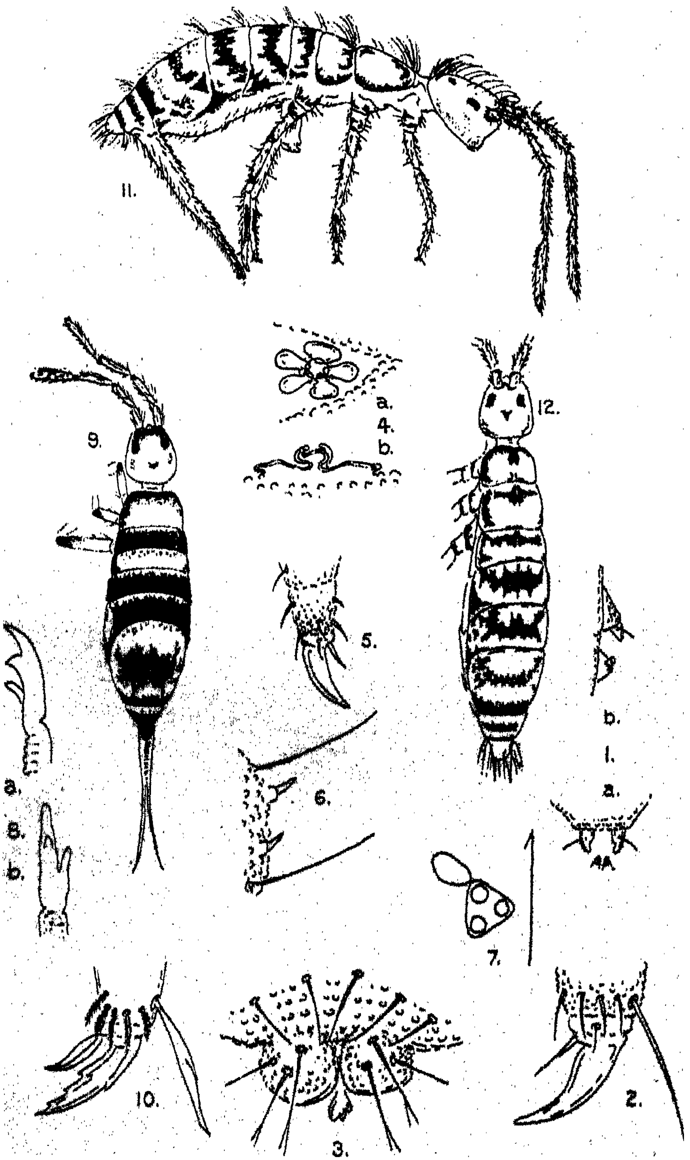

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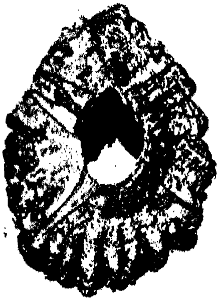
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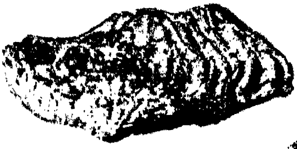
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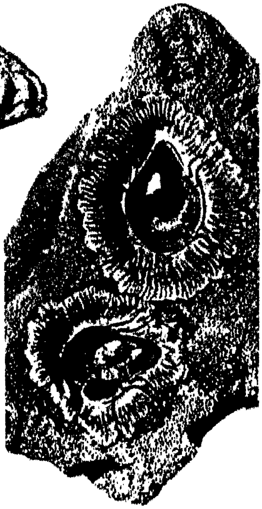
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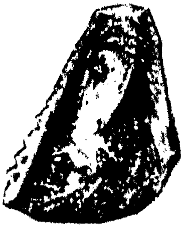
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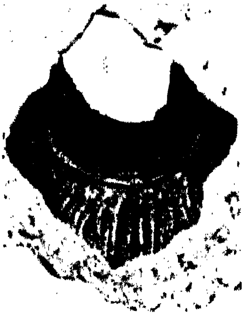
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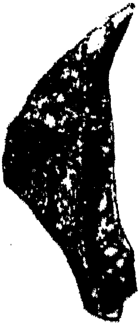
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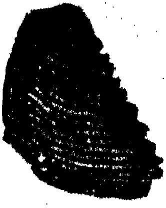
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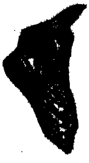
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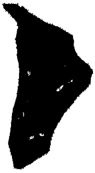
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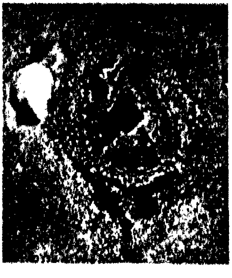
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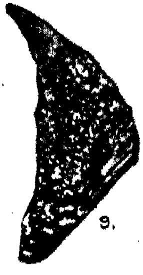
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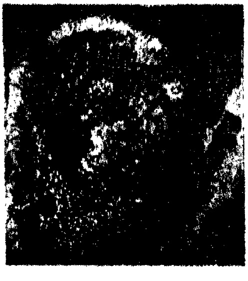
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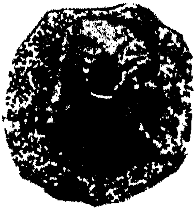
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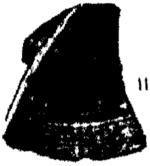
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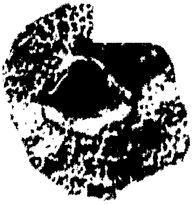
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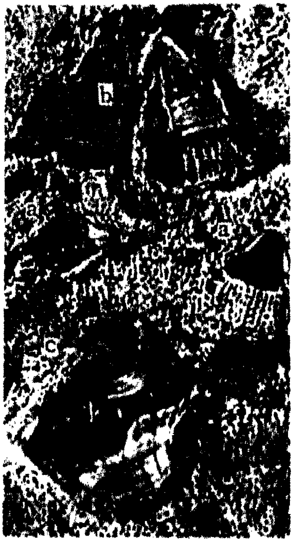

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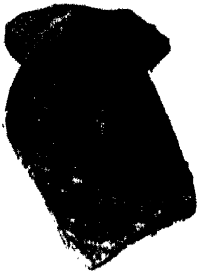
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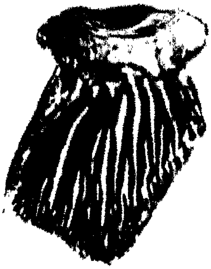
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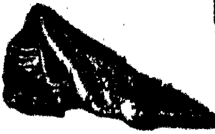
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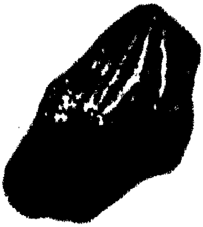
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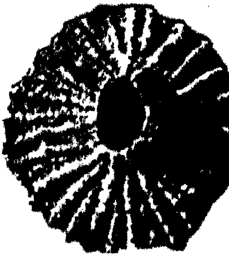
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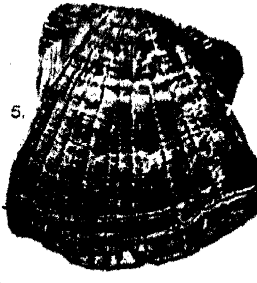

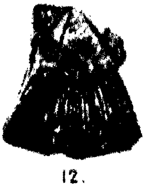
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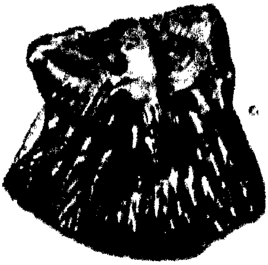
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